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Cocoanut Fiber: Its Growth, Collection, Bleaching and Dyeing

Introduction—Leaves of Palm—Growing in Malay States—Maturity—Use of Hard Shells—Method of Bleaching—Basic Dyes—Substantive Colors—Acid Colors—Sulphur Colors—Looms—Cropping Machines—Conclusion

By FRED. GROVE-PALMER, A.I.C.

ALTHOUGH of recent years there has been a very decided spread in the use of cocoanut fiber or coir textile fabrics for domestic purposes, the industry generally has the weight of years of experience behind it. In those countries in which the cocoanut flourishes the fiber has considerable value, and from these it spread to distant lands, the inhabitants of which were not slow to realize the usefulness of this exceedingly tough, if rather coarse, material.

The fact that it is somewhat dark in color and that the majority of shades in which it could be dyed were not strong enough to overcome the deep brown of the natural fiber prevented it from being employed in many situations for which it is eminently suited, but of late the attention of the dyers has been turned more closely in its direction and the result has been that there is a considerable increase in the volume of trade in coir fabrics of a decorative nature. It is now possible to go a good way toward bleaching the fiber and dyeing it in really artistic colors, and the industry has taken a fresh slant: instead of being relegated to the floors of sculleries and wash-houses, it has come into greater prominence in the home.

Coir fiber is obtained from the cocoanut palm (*Cocos nucifera*), which is a member of the Natural Order—Palmaceae. This tree is one of the kind that a beneficent Mother Nature provides with a view to supplying the natives with most of the amenities of life; bamboo is another, but the cocoanut palm has it beat for the number of uses to which it can be put. It grows to a height of from 50 to 100 feet, and is to be found growing in many tropical countries, especially the East Indies, always preferring the neighborhood of the sea in its wild state. It is very widely cultivated, the area of ground given over to its growth being constantly on the increase owing to the extensive use of the oil obtained from the fruit in the manufacture of soap and margarine. So great has this become that the cocoanut is at the present time one of the world's commercial products and, though exact figures are unobtainable, it has been authoritatively stated that the total area of land devoted to its cultivation at the end of last year was greatly in excess of three million acres.

Leaves of Palm

The leaves of the palm have a length of some 20 feet, and blossoms, which are male and female in separate flowers, grow in spikes. The fruit, which is so well known that it hardly needs description, is the large, hard-shelled nut common in the markets of all countries. The nut does not grow in the comparatively smooth state in which it reaches the consumer, but is enclosed in a thick coating of fiber divided into three sections or lobes. It is this, which weighs about one-third of the total, that supplies the coir. The quantity of coir that is available for use is enormous, amounting to something approaching six million long tons annually, though that actually used forms but an infinitesimal fraction of the total, while the amount that is exported for use in America and in the various European countries is still less. The huge bulk that is not so utilized is either employed as manure or burnt.

In the following table, obtained by courtesy from official sources, will be seen the quantities of coir yarn imported into the United States during the year 1927:

Imported from—	Quantity (pounds)	Value (dollars)
Belgium	10,360	555
France	34,320	2,325
Germany	157,362	13,628
Netherlands	80,344	5,843
United Kingdom	87,514	6,431
Canada	15,120	832
British India	1,478,047	78,047
Ceylon	22,624	696
Java and Madura	336	35
French Indo-China	5,040	391
Philippine Islands	86,750	15,000
Total	1,977,818	123,783
Total for 1928	1,380,871	75,739

In order to get an idea of the world's consumption, the following data, supplied by the courtesy of the Director of the Imperial Institute at London, England, relating to the exports from Ceylon and India to the markets generally may be studied with interest:

	CEYLON		INDIA	
Class of material—	(pounds)	(dollars)	(pounds)	(dollars)
Bristles	34,270,860	493,560		
Mattress fiber	68,431,056	369,310		
Coir yarn	26,153,168	769,080	131,143,200	4,069,605
Matting (yards)	75,759	6,895		
Mats (pieces)	14,657			
Rope, twine, etc	4,301,056	107,155	13,347,096	664,500
Miscellaneous	260,972	9,465	.....	.....
Unmanufactured	.....	.....	1,369,520	34,785

Growing in Malay States

In the cocoanut-growing parts of the Malay States, where there are something like one-half million acres of ground given up to the cultivation, producing approximately a million tons of fiber, we are officially informed that the quantity of coir used is negligible; a small amount is converted into yarn and other goods in the goals, and this is sold locally. Of that which is made in factories, the following quantities are exported, mainly to neighboring countries:

For year 1928—	Pounds
Fiber	41,400
Ropes, twine, etc	3,900,800
Mats, matting, etc	4,068,704

Oddly enough, the same States import from the countries to which the above commodities are sent the following quantities of the same:

	Pounds
Fiber	699,600
Ropes, etc.	10,578,800
Mats, matting, etc	8,791,216

Although at first sight it appears to be exceedingly unwise for a country to import such a comparatively large quantity of manufactured articles when it not only grows the raw material but actually engages in the manufacture, it will be shown in a moment that there is something of a reason for this anomaly. The countries with which the one-sided exchange is made are Siam and the Nederland Indies.

The sole object in the mind of the grower of cocoanuts is the production of the dried meat of the fruit, the copra, from which the edible oil is ultimately extracted. The fiber has no importance for him; but the textile man, very naturally, has some qualms when considering the waste of such enormous quantities of raw material.

This waste calls to mind the matter of the hard shells which are largely used for fuel, though during the World War they found a highly valuable outlet for the making of charcoal to absorb "gas." This charcoal was used in the gas masks of our troops and was also used by the Allied armies in France.

The Cocoa de Mer is another sort of cocoanut; this is known to the botanists as *Lodoicea seychellarum*. It has very large fibrous husks which enclose two and sometimes three nuts; the male and female trees are separate, and it received its name of the sea cocoanut because it was often found floating in the ocean by the early explorers.

The cocoanut trees in plantations are subject to the attacks of parasites, among which the cocoanut beetle is perhaps the most serious enemy the planters are called upon to combat. This is a long-horned insect of some size, whose grubs bore into the young trees, killing them in many instances. The natives employed in attending the trees fry these larvae in oil and consider them a great delicacy.

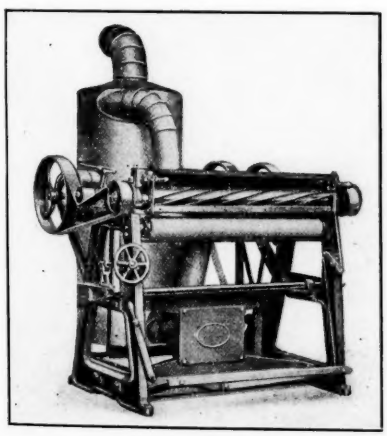
The fact that the natives look upon the cocoanut palm in the light of a universal provider of necessaries of life has been alluded to and some of its varied uses may be here enumerated: The large leaves prove very useful as

roofing for the houses and as mats for the floors. The unripe nuts yield a very refreshing beverage, while the ripe ones contain the milk that is considered a great delicacy. The fiber of the husks, the subject of this notice, supplies them with ropes, cordage, matting and brushes, among other things. The spathe in which the flowers grow may be tapped before the blooms appear and will then yield another drink known as "toddy" in India; we call it "tuba" in the Philippines. When opportunity offers, this tuba is allowed to ferment, when it makes an intoxicating liquor. This is sometimes distilled and the spirit so obtained is known as "arak"; at other times the juice of the flower-spike is evaporated without fermentation and then gives "jaggery" or palm-sugar. The hulls of the nuts are polished and carved, being used for cups, while the flesh of the nuts is edible. Thus, it will be seen, this useful tree supplies food, several sorts of drink, housing and furniture, and there is no doubt that if it did not happen to grow in a climate that renders clothing more or less of a superfluity the inhabitants would have found a means of utilizing some part of it for clothing.

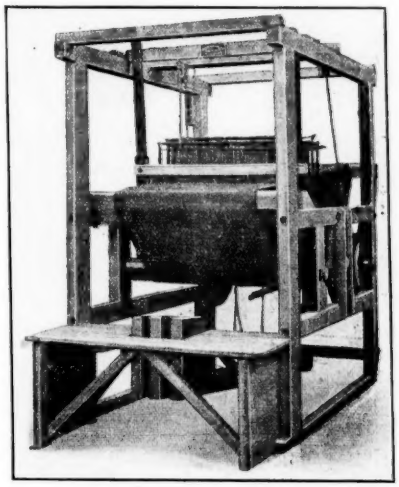
Maturity

The cocoa palm comes to maturity about seven years after planting and it remains a paying proposition for fourscore years, the harvest from each tree being from fifty to seventy nuts a year. The blossom does not make its appearance all at one time, but at intervals, and it is thus possible to see nuts at all stages of ripeness side by side. The copra grower collects only those which are quite ripe, but it has been found that the fiber which is derived from immature nuts is not only lighter in color and finer in texture but is also considerably stronger. This, in a great measure, explains why so much of the fiber is allowed to go to waste.

When gathering nuts for the fiber, the plantation workers climb the trees and cut off those which are suitable, permitting them to fall to the ground, whence they are collected and husked on a hardwood or iron spike fixed in the ground; the coating of fiber is then pulled off. In more up-to-date places a machine is used for decorticating the nuts; this is capable of dealing with from five to ten hundred nuts an hour. The lumps of fiber are thrown into wooden or iron tanks or brick-lined pits filled with sea water for the purpose of retting; in more advanced factories there are means of admitting steam in order that the work may be completed more quickly, as it has been found that prolonged soaking is detrimental to the quality of the product. When possible the tanks are situated on the seashore so that the rise and fall of the tides may keep the water constantly renewed, but in other places care is exercised in using only water that is free from traces of iron, because this would react with the tannin that is one of the components of the fiber and give rise to a darkening of the color. In any case a constant change of water is desirable in order to wash away harmful bacteria that would tend to rot the fiber.



Cropping Machine



Coir Matting Looms

The husks when fully retted are lifted and banged with wooden mallets or beetles, with a view to separation of the individual fibers; these are well washed to remove all traces of interstitial tissue. The mechanical improvement in this department has led to the making of special machines which crush the fibers between rollers and then pass it on to the extractors or breaking-down machines. The object is the thorough disintegration of the husks into their fibers, and when this has been accomplished the whole mass is dried by turning it over as it is spread in layers in the sunshine. When that has been done, the whole is run through a willower, which takes out all the broken-down fibers, dust, etc., and the batch is then ready to be sorted into the various market gradings. These are:

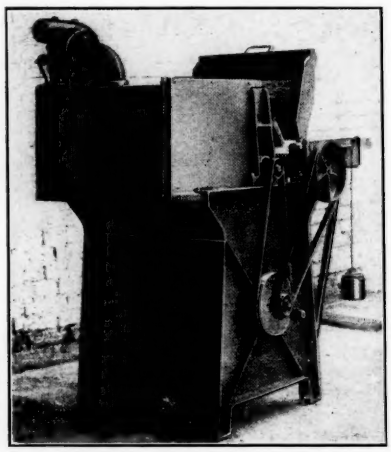
Mat Fiber—This is of the finest quality and is spun into yarns for the manufacture of ropes, twines and matting.

Bristle Fiber—This is coarser and stouter than the foregoing, and is employed in the manufacture of brushes and brooms.

Curled Fiber—This is a short variety, and finds considerable use in the making of mattresses and other forms of upholstery.

Use of Hard Shells

The hard shells, in addition to their fuel value, to which allusion has already been made, might be utilized



Carding Machine, Left Side with Fan

in a still further manner if it were not for the cost of transport; this is in getting valuable products by destructive distillation at a temperature of about 550° C. The nature and yield of these may be seen in the following tabulation given by Bunbury:

	Per Cent
Moisture	7.60
Total distillate	46.40
Charcoal	35.20
Gas	18.40
Acetic acid	5.79
Methanol	1.12
Tar	5.80

The best fiber is produced by immature nuts, therefore to get good fiber it is necessary to waste more valuable copra. This is a very undesirable position, and much research has been carried on by those interested with a view to finding some sort of a compromise. It seems that the process introduced by Van der Jagt has gone a good distance toward finding a solution of the difficulty. In this the ripe nuts are gathered and the fibrous hulls receive a chemical treatment and subsequent artificial drying whereby the fiber is produced in a commercially valuable condition. The only snag appears to lie in the costly nature of the installation required to make it a paying proposition which would render its use possible only in fairly large plantations which handle a minimum of three million nuts a year.

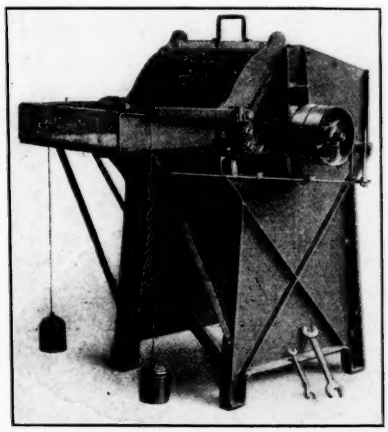
Cocoa fiber, or coir, is clean, coarse, tough and resilient; cordage made from it will withstand a stretch equal to one-quarter of its length, and it has the great advantage of being stronger when wetted with sea water than in the dry state. It is consequently exceedingly well suited for rigging the small-sized vessels worked by the natives. It is not very costly and has the merit of being the most durable of all commercial fibers. The dust and other refuse has a high manurial value.

The manufacture of textile fabrics from coir is, to a great extent, a series of hand processes in India and Ceylon, where large quantities of a form of burlaps are made to be used as sacks for the transportation of copra, for the coaling of ships and for other like purposes.

When we arrive at a consideration of the production of a better quality of goods such as may be used in the decoration of the home, an altogether better class of work is required. In the first place, it is usual to treat the fiber with a bleaching process in order that there may be a better chance of dyeing it in artistic shades. It does not bleach white, but the treatment mentioned below serves to abstract some of the natural color and give much brighter results.

Method of Bleaching

The method of bleaching, as might be expected, varies slightly according as the fiber is coarse or fine; the differences lie in the greater strength of the solutions re-



Carding Machine, Right Side Without Fan

quired in some cases for the coarser kinds and in others in the longer time of exposure to their action.

Dealing first with coarse fiber, the following is the sequence of the process:

1. Soak for twenty-four hours in water which is kept boiling.

2. Boil for six hours in a solution of caustic soda made as follows: Caustic soda, 30 pounds; water, 120 gallons.

3. The above liquor is drawn off and a fresh bath of the same strength poured, boiling for a similar time.

3A. Repeat No. 3.

4. The batch of fiber is acidified in the following: Hydrochloric acid (commercial), 1 gallon; water, 100 gallons. The time of soaking is one hour.

5. The foregoing are the preparatory processes; this is the actual bleaching. The fiber is kept in the following liquor for about eighteen hours: Chloride of lime, 30 pounds; water, 120 gallons.

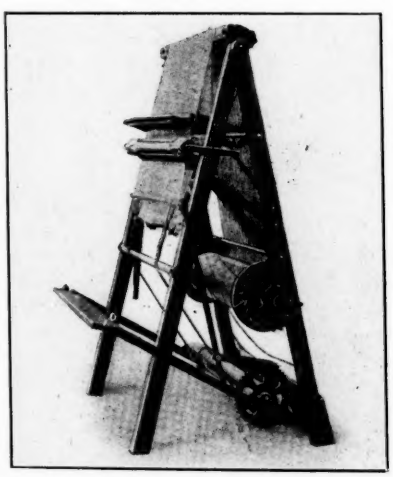
6. The batch is lifted and plunged into a bath as mentioned in process No. 4.

The last stage consists in thoroughly drying the fiber after it has been washed free from the acid in water. The drying is generally performed in the open air, sunny days being chosen.

Bleaching the fine fiber follows the same lines, but with the following differences:

1. Soak for twelve hours.
2. Four hours in half-strength soda.
3 and 3A. As above.
4. Soak for half an hour in same strength acid.
5. Bleach for six hours in half-strength liquor.
6. As in fourth process.
7. No change.

Owing to the color of coir, the fabrics that are made from it cannot, of course, be dyed in delicate pastel shades; full bright tints are obtainable, however, as well as those of a duller nature, and for these dyes belonging to the basic, substantive, acid and sulphur classes are all available. In order to overcome the impenetrability of the fiber, a process has been brought out (German Patent No. 428,038) for the purpose of assisting the dyer. This consists in steeping the batch in a bath containing 2% or



Loom Frame

3%, calculated on the dry weight of the goods, of sulphite cellulose lye obtained from the paper mills.

Basic Dyes

Allusion has already been made to the tannin which is contained in cocoa fiber; this serves the purpose of a mordant for basic dyes and there is, in consequence, no necessity for this usual part of the process. The goods are entered into an almost boiling bath, except when using Auramine, which will not stand a temperature above 50° C. Between 3% and 5% of acetic acid is added; alum may also be used with basic dyes, except the Rhodamines. More acid may be called for to exhaust the bath, and it is an economy if the dye solution is added in several portions. It is not possible to state a time for dyeing; it must be continued in the boiling bath until the desired color is obtained. Some manufacturers of basic dyes advise starting with a cold liquor and quickly raising to the boil, then allowing the goods to steep in the cooling liquid for an hour. It is not necessary to wash after dyeing.

Some of the suitable colors will be found in the ensuing list:

Auramine O	Magenta
Chrysoidine 3R	Victoria Blue B
Rhodamine 6G	Brilliant Green B
Safranine 6B	Tannoflavine T
Methylene Blue SB	Tannin Orange R
Victoria Green WB	Rhodamine B
Diamond Phosphine GG	Methyl Violet
Sabaphosphine RR	Tannastrol NS
Rosazeine 6G	Malachite Green

A useful formula for the production of a yellowish green is as follows: Auramine O, 0.75%; Methylene Blue SB, 0.25%. None of the basic colors are very good with regard to fastness to light.

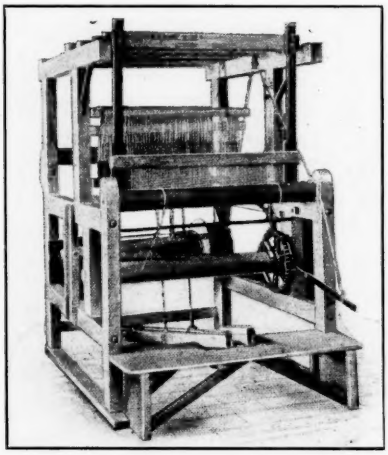
Substantive Colors

There may be a very few of this large range of dyestuffs that are unsuitable for coir, but it may be taken as a fairly safe statement that good results can be obtained with any of them. They have the merit of being of good fastness to water, light and rubbing, and in addition they penetrate the fiber moderately easily. The goods are entered at the boil, kept at that for an hour and fed in the slowly cooling liquor for half an hour longer. It is usual to put from 10% to 30% of common salt into the bath, but this may be substituted for one-third less quantity of Glauber salt if desired. A list of suitable dyes is not given, as it would be merely a repetition of the makers' catalogues; but experience has shown that the following individual colors give remarkably good results on color: Pyrazol Orange, Benzopurpurine, Chloramine Brilliant Red and Sky Blue FF.

Acid Colors

The shades obtained from these dyestuffs have the advantage of being faster to light, washing and rubbing than the foregoing and are also considerably brighter, giving in many cases clearer and more brilliant tints than

the basic colors themselves. So much is this the fact that in some of the higher grades of cocoa fabrics very pleasing and artistic shades have been produced. In dyeing, a short bath is used and the goods are entered at the boil in a liquor which contains 5% of alum and from 10% to 20% of Glauber salt. The temperature is maintained for



Mat Looms

around forty-five minutes, when the steam is turned off and the batch left in for half an hour more. After lifting, the goods are not washed but pass straight through to the drying plant. There is apt to be a large waste of dyestuff unless the baths are used for continuous dyeing, as it is difficult to get them properly to exhaust; the usual additions of half to three-quarters as much dye as was originally used should be made for each fresh lot of coir fabric put through. In the list given below will be found a number of the acid dyes that have been found to yield good results on this fiber:

Quinoline Yellow	Acid Violet 4BNS
Croceine Orange Y	Wool Green S
Croceine Scarlet MOO	Xylene Fast Green B
Azo Rubine Extra	Acid Black SO
Wool Violet 4BN	Azo Yellow A5W
Acid Green L Extra	Wool Orange A
Fast Acid Green B	Cocoa Scarlet 2B, AZ
Nigrosine 128	Cloth Red B
Xylene Light Yellow	Acid Fast Violet BG
Orange II	Alphazurine FG
Acid Scarlet 2R	Nigrosine K
Xylene Red B	Induline B Extra

Sulphur Colors

When the demand arises for coir fiber to be dyed in colors that are exceedingly fast to light but in which the brilliance of coloring is a secondary consideration, the dyer at once falls back upon the range of sulphur dyes, which is not very extensive but has many very good qualities. The liquor is prepared by making of the dye a solution in water containing an equal quantity of sodium sulphite crystals to which is added from 3% to 5% of dry sodium carbonate. When the dye has dissolved it is poured into the bath, which contains from 10% to 20% of Glauber salt. The batch is put into the cold liquor and the temperature is raised as rapidly as possible until it is at the boil, when the heat is shut off, leaving the goods working for a full hour. The coloring matter is not exhausted, and therefore it is economy to use these as stand baths, bringing up to strength as indicated in the case of acid dyes.

The baths in this case are strongly alkaline, and it is therefore necessary to wash the goods very thoroughly when they have been dyed. Among the colors that give good results the following will be found:

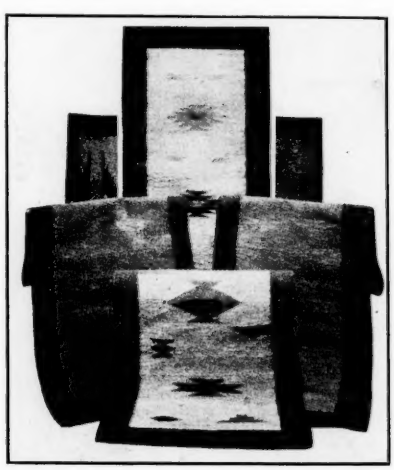
Sulfur Yellow 2G	Thional Yellow G
Sulfur Bordeaux R (*)	Thional Orange G
Sulfur Green 2G	Thional Brilliant Green 2G
Sulfindone Indigo Blue BG	Thional Brilliant Blue 6BS
Sulfur Black F	Thional Black T

*This is a very dull color.

It should be mentioned, perhaps, that though the foregoing remarks on dyeing refer to the treatment of fabrics, it is just as easy to dye in the yarn or the fiber itself if the need arises.

It would not be fair to leave the subject of coir fabrics without making some reference to the machinery that has been introduced for the manufacture of the various sorts of mattings and other materials to which it lends itself.

An improved teasing machine with a capacity of from



Seamless Squares

eight to ten tons of fiber a day is made of channel steel, being thus lighter and stronger than the old cast-iron type. The power needed for this engine is only 4 to 5 horse-power; it weighs 1¾ tons, or when packed for shipment about 2¼ tons, and has a full equipment of tools. It runs on dustproof ball bearings, and the drum

consists of four steel heads keyed to a 3-inch shaft. Forty-two lags are bolted to the heads; these are made of seasoned hardwood and carry 3-inch cast-steel pins. Three interchangeable hardwood rollers carry hook teeth at 1-inch pitch all over. There is a carefully balanced fan with three cast heads each with five steel blades. All parts are guarded and covered.

The latest carding machine is chain-driven, with lags and drum interchangeable; a strong current of air quickly separates all dust and prevents clogging of the teeth. The hinged cover carrying the fixed lags acts as an automatic release should the machine be overfed. This machine runs on ball bearings and all the teeth are made of forged and tempered tool steel. Its bare weight all complete is less than a quarter of a ton, with an added 200 pounds for packing for shipment.

Looms

A useful loom frame for mat making can be fitted with a warp roller instead of a creel for fine work; this prevents chafing of the yarn. It is a self-supporting machine, requiring no fixing, and is easier to work than the ordinary loom.

Looms are made in five sizes—2/4, 3/4, 4/4, 5/4 and 6/4—and are supplied with harness and reed. The rolls and beams are of pine and the ironwork is exceptionally strong to allow for rough usage. Looms intended for larger quantities of matting may also be obtained up to 12/4.

Cropping Machines

A cropping machine is fitted with dustproof ball bearings, as the coir clippings, being very hard, would otherwise cause heavy wear on the bearings; this point saves very much labor in lubricating and repairs. A treadle lifter allows the operator to lift the cutting unit very slightly with his foot, while his hands are free a manipulate the mats; this obviates cutting the corners of the mats. The dust extraction plant is incorporated in the machine, which reduces the cost and the power consumption. The weight of a complete 4-foot machine is half a ton, with the addition of 336 pounds for shipping case.

The coarseness of coir fiber prevents it from being used in a large number of places where other, finer fibers are employed, but its natural advantages are such that its disadvantages may well be overlooked in their favor. The improvements in weaving, bleaching and dyeing that have been indicated here will have shown that the field of its utility has been greatly widened during the past year or so, and its value for furnishing the greatly increased number of out-of-doors living rooms will be immediately apparent.

The City Dye Works, of Springfield, Mass., will expend $6,000 for new equipment and alterations.

The Hillside Dyeing & Finishing Company, of North Bergen, N. J., has filed notice of increase in capital

U. S. Industry, Hunchback

By Philip P. Jacobs, Ph.D.

IF you were to draw a picture illustrating the distribution of deaths from tuberculosis by ages, of those who died in any given year, you would find that between the period of fifteen and forty-five there was a decided hump or rise in the statistical curve. If you could visualize with some kind of magic glasses all of the 40,000,000 working men and women in the United States with tools and machinery and all the accessories of daily toil in a sort of composite group, out of that group would constantly arise the gigantic hump of tuberculosis saddled on the back of American industry.

While the death rate from tuberculosis has declined in the last twenty years with great rapidity, and while this decline has given encouragement to those who have been fighting the winning fight, there is still much room for painstaking thought when one considers such striking facts as these:

Out of 91,000 deaths from tuberculosis in the United States for 1926, 56,000 occurred between the ages of fifteen and forty-five, 62 per cent of the total number of deaths. Of that 56,000 considerably more than half, 30,000 fall between the younger age groups of fifteen to thirty. Here is the prime of American manhood and womanhood. Here are the men and women who are doing the day's work in American industry. How long can American industry go on with a hump on its back of such gigantic proportions? Think for a moment of the enormous amount of time lost as a result of sickness from tuberculosis. Everyone of those 56,000 men and women was sick on an average of at least 300 days before he died, a total of 16,800,000 days lost to American industry. If one considers the day's work from the point of view of production, and if the average daily production of these 56,000 individuals was not worth more than $3.00, a ridiculously small sum, the total loss in production alone is over $50,000,000.

And this is not all the story because these people died and in their deaths there occurred the tragic loss not merely of life, but of all the future possibilities of productivity. A statistician has determined that such a life is worth on an average of at least $5,000. Here is a total again of more than $250,000,000 wasted for American industry.

We may go still further in recounting this tale of loss because for every one of these 56,000 deaths the records show that there must be at least five living cases. Here are more than 250,000 living persons who have tuberculosis of whom at least another 50,000 will die this year and next year unless somebody does something about it.

But why go on? It must be apparent to any thinking person that tuberculosis is a tremendous incubus on the shoulders of American industry. Unlike any of the other leading causes of death in the United States, tubercu-

losis takes its victims in the prime of life and its deadliest toll comes in the years of greatest productivity. Heart disease, which is the leading cause of death in the United States, cerebral hemorrhage, cancer, nephritis, and Bright's disease, all of these, which are high in the classification of death and are now leading tuberculosis in the total figures, take their toll in the age group from fifty to seventy-five or eighty.

Here then is a challenge to American industry. The challenge to rid itself of tuberculosis. Repeated examinations of groups of all kinds have shown that in any normal industrial group, factory, office, or elsewhere, two out of every hundred when carefully examined will be found to have tuberculosis in some form or other. Employers frequently avoid opportunities to have their employees examined by saying they know there is no tuberculosis in their industry. The only industries where tuberculosis has yet been reduced to a minimum are those where after years of painstaking examination of applicants and careful medical supervision of all employees, tuberculosis has gradually been weeded out. Such industries, for example, as the Metropolitan Life Insurance Company, the Hood Rubber Company, National Cash Register Company, International Harvester Company, Sears, Roebuck Company, American Telephone & Telegraph and scores of others have reduced tuberculosis to a very low rate, but they have done it by a consistent, painstaking program of periodic examination of employees, supervision and correction of minor defects, careful education of all employees in matters regarding health, improvement of shop sanitation, and by other measures designed to control not only tuberculosis but other preventable diseases as well.

U. S. Industry, Hunchback, can be cured!

Safety Code for Textile Industries Approved

A code aimed to assure the safety of life, limb and health for workers in all plants operating textile machinery and equipment has just been approved as American tentative standards by the American Standards Association. The code is intended for voluntary adoption and use as a standard by both manufacturers and users of textile machinery and equipment.

The National Safety Council assumed the leadership for the preparation of the code under the auspices of the American Standards Association. The actual preparation of the code was in the hands of a technical committee of twenty-four men representing not only the manufacturers and users of textile machinery and equipment but also independent experts, representatives of government departments, represensatives of insurance organizations, and others. Charles H. Eames, president of the Lowell Textile Institute, was chairman of the sectional committee, and W. Dean Keefer, chief engineer of the National Safety Council, was secretary.

Among the organizations represented were the National Association of Cotton Manufacturers, the National Association of Wool Manufacturers, the American Society of Mechanical Engineers, the International Association of Government Officials in Industry of the United States and Canada, the International Association of Industrial Accident Boards and Commissions, the United States Department of Labor, National Bureau of Standards, the National Association of Mutual Casualty Companies, the Silk Association of America, the National Board of Casualty and Surety Underwriters, and individual manufacturers of textile machinery.

The requirements of the code apply to such textile machinery and equipment as plants operating pickers, cards, combing machinery, drawing frames, slubbers, roving frames, ring spinning frames, spinning mules, spoolers, twisters, wrappers, slashers, looms, inspection machines, folding machines, baling presses, sewing machines, cloth singers, washing machines, kiers, mercerizing and tenter frames, mangles, winders, dry cans, dyeing pedders, jigs and vats, color mixers, printing machines, soapers, aging boxes, pasters, dampeners, calenders, hookers, doublers, extractors, bottles, and other machinery and equipment used for similar purposes.—*Commercial Standards Monthly.*

1930 Spring Season Card

The 1930 Spring Season Card is now being issued by the Textile Color Card Association, according to an announcement made by Margaret Hayden Rorke, managing director.

Eighty colors in all are shown on the card. Blues are stressed as a dominant note in the spring mode, and are portrayed in three important families. There are two animated ranges of Italian and Mediterranean blues, one reflecting an undertone of purple and the other violet in cast. Included in the latter gamme is Naples Blue. Another new group of soft blues comprises, in addition to Linen Blue, which is a deep sky tone, Arosa Blue, Kyoto Blue and Tokyo Blue.

Greens are highlighted in two distinct groups. Samoa, Corinthian Green and Ionian Green are of bluish tonality. Wood-Nymph, Pastoral Green and Bamboo Green are yellowish greens adaptable to the sports mode.

Of special interest for spring are the darker mauvish browns which will be smartly combined with lighter nuances, such as Cloud Pink or Aquatone. Chocolate Drop and Iris Brown represent the new note in this color family.

The Sterling Textile Company, of Springfield Mass., has leased the dyehouse of the Chilton Company, at Webster, which will be operated in conjunction with the company's plant in Springfield.

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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NOVEMBER MEETING OF NEW YORK SECTION

The November meeting of the New York Section of the American Association of Textile Chemists and Colorists convened Friday evening, November 22, 1929, in the clubroom of the Building Trades Employers' Association, 2 Park Avenue, New York City, Robert H. Gaede, Vice-Chairman, presiding.

The routine business of the Section was transacted.

Chairman Gaede—If there is nothing else to come up we will proceed to the technical side of our meeting.

I am sure that you all or a good many of you have already met Mr. Smolens, of the Buffalo Electrochemical Company, who is to talk to us on, "Bleaching of Textile Fabrics with Peroxide." Mr. Smolens! (Applause.)

. . . Mr. H. G. Smolens presented a prepared paper on this subject as follows:

Bleaching with Hydrogen Peroxide

By H. G. SMOLENS

Consulting Engineer, Buffalo Electrochemical Co., Inc.

ASSUMING the goods, the water and the equipment as fixed, the variables in hydrogen peroxide bleaching are time, temperature, total alkalinity, pH and hydrogen peroxide concentration.

It is possible to manipulate these variables into an almost infinite number of combinations, which is the reason why it is possible to get similar peroxide bleaching effects in so many apparently different ways.

Within the past several years, improvements or complete changes have been introduced into almost every known peroxide bleaching process. These have been made possible, partly by the availability, in ever-increasing quantities, of the very pure and stable 100-volume hydrogen peroxides, partly by the large number of investigations and tests, over reasonably long periods of time, of actual bleach house operations, not of laboratory experiments.

Entirely new theories of peroxide bleaching have been advanced, and new methods of control and testing have been developed.

In spite of all this work, however, there is still too much unknown about even ordinary peroxide bleaching. This means that almost every bleach house must be considered as a separate problem and worked out accordingly.

To add to our troubles, we now have to contend with the various rayons, either alone or in combinations, which have taken their place among cottons, silks and wools.

The very best hydrogen peroxide bleaching, from the standpoints of color, effect on the fiber, and cost, is usually done when the temperature and the total alkalinity are a maximum, while the time, the pH, and the peroxide concentration are a minimum.

The less unnecessary chemicals introduced into the solution which is to do the bleaching, the easier it is to obtain and to maintain the ideal chemical conditions required. This is one of the very good reasons for the growing popularity of the 100-volume hydrogen peroxides.

Wool Bleaching

In all wool goods or in wool mixtures, the wool is the fiber most sensitive to any physical and chemical changes that may possibly occur during the bleaching. Therefore, care must be taken that the bleaching be done well within the danger limits for wool, even though no one knows exactly what these limits are.

The scouring and bleaching of wool depend largely on the form of the wool to be bleached and on the processing the bleached wool is to receive. For instance, a fine raw stock that is to be carded and spun after bleaching needs a great deal more care and attention to the details than a piece of cheviot that is being bleached down for dyeing a light blue. A fine worsted knitting yarn must be scoured and bleached differently from a shoddy tweed overcoating that is given a peroxide bleach to improve the finish and the appearance. We certainly would not think of scouring and bleaching camel hair as we do East Indian wools that are to go into carpet yarns.

It is more important to give wool a good scour than it is to give it a good bleach. Almost any kind of a peroxide solution will bleach a well-scoured wool, but the best wool bleaching peroxide solution will not give good results with poorly scoured wool.

Since wool is particularly sensitive to hot alkaline solutions, it is usually advisable to use comparatively high volume hydrogen peroxide solutions that have the maximum total alkalinity at any safe pH, and to do the bleaching at the lowest temperatures possible within the bleaching time limit. This ordinarily requires standing bath work with reasonably accurate manipulation and control.

It is just as possible, practical and desirable to match bleach shades in successive lots of wool as it is to match colors. This is being done in many wool bleacheries.

Cotton/wool mixtures are usually peroxide bleached to allow even dyeing of light shades. Sometimes they are bleached to clean up a lower grade cotton than should be used with wool. In such cases the scouring is the most important part of the bleaching process.

Silk/wool mixtures are usually crepes of some kind. Here, also, the most important part of the bleaching process is the boiling off of the silk, which also effects the creping of the wool.

Silk Bleaching

Silk can stand quite a severe peroxide bleaching, but only tussahs and the yellow Jap and Italian silks have to be given any special attention. Most of the ordinary silks are white enough after the boil off so that a mere dip in the proper hydrogen peroxide solution will allow them to take a light tint for a very good white. Therefore, the easiest way to bleach them is to allow them to pass through a hot alkaline peroxide solution at the end of the washing after the boil off, shell them for a short time and then finish.

Cotton/silk mixtures, or cotton back/silk face fabrics are peroxide bleached in order to improve the appearance of the cotton so that the public will pay close to an all-silk price for them. If a very good, easy-to-bleach cotton is used in these fabrics, it is advisable to boil them off before bleaching. If a poor grade of cotton, or one hard to bleach is used, it is usually advisable to boil off and bleach simultaneously. In this way the cotton can be given a pretty hard bleaching while the silk is still protected from chemical injury by the gum.

Rayon/silk fabrics must be handled rather carefully in order that the various cleansing and bleaching solutions required for the silk will not injure the rayon. It is quite necessary to determine the alkalinity and temperature limits for this class of work before any large quantity is bleached.

Cotton Bleaching

There are many claims being made for bleaching cotton with hydrogen peroxide which are not strictly accurate. For instance, one large argument for peroxide bleaching of cotton is the permanence of the whiteness. This is quite correct, but peroxide bleaching has no exclusive right to permanent whiteness. It just happens that the ordinary process of bleaching cotton with peroxide automatically converts the form of cellulose that has a tendency to turn yellow into another form of cellulose that stays white. But the same thing can be done with hypochlorites, permanganates or any other oxidizing bleaching agents if they are properly applied. Another uncertain argument for peroxide bleaching of cotton is that the cotton loses less weight in this process, than in the ordinary boil and chemic process. It is possible to conduct a peroxide bleach on cotton which will produce little or no loss of weight, but a very good white. However,

this cotton is not well bottomed. To get a real bleached bottom for mercerizing, dyeing or printing, you must remove from the gray cotton almost everything except the actual cellulose, so that the loss in weight depends entirely on the percentage of impurities in the gray cotton. This is a matter of using enough caustic soda in the peroxide bleach boil, and of boiling a long enough time.

It is only a little over two years since caustic soda has been used in the United States for bleaching cotton with peroxides. The first successful process of this kind was worked out for cotton yarn at the Philadelphia plant of the Franklin Process Company. Now practically all cotton yarn in package form is being bleached with hydrogen peroxide in the various package bleaching machines.

From this beginning it was a logical step to go on to kier bleaching of cotton piece goods. At the present time hydrogen peroxide bleaching has been developed to the point where we think that we know how to work out a peroxide bleach kier boiling process that will produce any desired bleached bottom at a reasonable cost.

The most economical cotton bleaching is done in kiers because the increase in the chemical cost of the peroxide bleach boil is very materially counterbalanced by the speed of the bleach process and by the reduction in the number of operations, as compared with the conventional boil and chemic processes.

The amount of caustic soda to be used depends to a large extent on the previous processing that the cotton has received. Cotton mercerized in the gray, for example, would not require nearly as much caustic in the bleach boil as cotton that has received only a gray sour. The type of kier, the amount of water required for the kier bleach charge, the presence of colored yarns in the cloth and the finishing that the bleached cloth is to receive, all determine the amount of caustic that should be used. This caustic must then be properly buffered by silicate of soda in order that the bleach boil liquor be stable, i. e., the pH remain constant during the entire bleaching operation.

From 1½% to 3% of hydrogen peroxide, based on the weight of the gray goods, will give an excellent single boil bleach on almost any kind of cloth properly prepared for the kier bleach boil. If more than 3% is required the cloth should be given a two-boil peroxide bleach process. From the kier the cloth is washed and run into the white bin, ready for finishing.

Heavy goods that cannot be handled in rope form may be successfully and economically bleached with peroxide in an open width kier, on jigs, or in any equipment in which the goods can be passed, for a sufficient length of time, through a boiling solution containing alkalies and hydrogen peroxide.

Where it is possible and advisable to run a continuous peroxide bleaching process a series of four or five slack washers, with a small jay box between each two, will take care of from forty to fifty thousand yards of cloth, on the basis of four-yard goods, per working day.

Rayon/cotton goods may be bleached exactly as all cotton goods, in kiers, on jigs or in a continuous process, provided the machinery for handling the wet goods will not injure the rayon either by pulling or squeezing.

Rayon Bleaching

There is not a great deal known about peroxide bleaching of rayon in skeins. This is mainly because the manufacturers of these yarns, most of whom do their own bleaching, believe that only hypochlorites can do this work for them. There are several smaller bleacheries now turning out very good-looking peroxide bleached rayon yarns, especially fancy yarns such as boucle. The problem of this work is in the handling of the wet skeins, not in the actual bleaching. About a year ago a surprisingly successful result was obtained in the peroxide bleaching and in the simultaneous desulphurizing and bleaching of rayon yarn in package form in one of the package bleaching machines.

Knit rayon tubing is being bleached both for white and for light colors with hydrogen peroxide. Here again the greatest care must be taken in the handling of the wet cloth. We have at various times placed pieces of all rayon knit tubing into all cotton knit goods kier bleach boils containing plenty of caustic soda, and they have taken on excellent bleaches. However, there is no machinery for removing such cloth from the kier, so that a kier bleach of rayon is not yet practicable.

So many new methods of hydrogen peroxide bleaching of wools, silks, cottons, rayons, straw, hemp, ramie, alpaca, camel hair in the raw stock yarn or piece are now available, that every bleacher should investigate them in comparison with his present bleaching process in order to make sure that his process is not obsolete.

Discussion

Chairman Gaede—I am sure we all know a little more about peroxide bleaching than we did before, and if anyone has any questions he would like to ask Mr. Smolens, don't be afraid to ask him.

Louis S. Zisman—I should like to ask Mr. Smolens if he can indicate any special method that would work out satisfactorily using peroxide on Japan silk. Mr. Smolens, you said in the early part of your talk that it

requires perhaps severe treatment. What I should like to know is, Is it possible to get a real good white?

Mr. Smolens—It is possible but it is expensive.

Mr. Zisman—By "expensive," what do you mean? Do you have to use additional material?

Mr. Smolens—No, you use the regular chemicals but you have to bleach it in stages. It might take five or six days to get a real white.

Mr. Zisman—But you can get it eventually?

Mr. Smolens—Yes, you can get it. You have to handle Japan silk just like you handle a very fragile vegetable fiber, like straw. You have to bleach it in stages, and the reason you have to do that is because the kind of solution that will give you a quick bleach on that fiber will destroy it. I have had that come up in hosiery.

Mr. Zisman—That is what I am particularly interested in.

Mr. Smolens—Where you get those yellow heels—

Mr. Zisman—If it is going to take five or six days, I hardly think it is practical. And yet suppose the company tells you you have to get a white?

Mr. Smolens—Then you have to tint it.

Mr. Zisman—What I have reference to—you know, when you are asked by your company to make something you can's say, "The thing is impossible" (Laughter.) I have found that out. The funniest thing about it is that there is usually some way out of it.

This is what I am really interested in: In the first place, can you tell me what that yellow coloring matter is? Of course, it is something of vegetable origin. Some say it is what the worms eat that makes the difference in color. I really don't know definitely just what it is. I wondered whether you did.

Mr. Smolens—We don't know what the natural colors are. The only thing we think we know about that is this: We believe the color that is on wool is an acid color, an acid dyestuff of some kind, and the reason we believe that is, if you bleach a lot of wool by immersion in a peroxide solution, and after that wool is bleached you allow that solution to become slightly acid, you get a very level dyeing of some kind on that wool which was bleached before the solution turned acid. And that is perfectly fast. I have never been able to get it off.

Mr. Zisman—One more question: Have you found in your experience that any pre-treatment of any special nature has helped the white, I mean pre-treatment before the peroxide treatment?

Mr. Smolens—Yes.

Mr. Zisman—There have been people who have claimed that. I have tried things, myself, and to a certain extent have succeeded, but I wonder whether there is any special thing you can recommend.

Mr. Smolens—Ordinarily we suggest that any fiber like a silk fiber or a wool fiber that has to be given special treatment should not be used for white. But where it is used we just have to take a guess like everybody else and one guess is as good as the next. (Laughter.)

I do think that an aftertreatment is much more valuable to peroxide bleaching than a preliminary treatment on animal fibers. That is, if you can get a fairly good reduction in the color with peroxide, and you can do it on this yellow silk—if you use a 4 or 6 or 10 volume solution on it and soak it overnight, let's say, and if you use a lot of alkali and keep your temperature low in this concentrated peroxide solution, then wash it thoroughly and give it a bisulphide treatment or hydrosulphite treatment, you will reduce the shade still more. But the trouble there is that you have a lot of white silk in that stocking which might be affected by this severe treatment. If you have a piece of cloth or a stocking of all one grade of silk, then the problem is a great deal easier than if you have two or three different grades of silk in the same fabric, all except one of which are easy to bleach, because the bleaching that you have to give that fabric to get the hard one white might destroy the others.

John J. Sokolinski—You mentioned in the early part of your paper the Franklin process where you used a small percentage of caustic originally. Do I understand that that was the beginning of kier bleaching?

Mr. Smolens—No.

Mr. Sokolinski—You said you used a small amount of caustic, then followed up with silicate.

Mr. Smolens—No, we never did that. The first form of cotton bleaching was with just peroxide and silicate, and with peroxide and silicate if you use enough of each, you can get cotton white, but it is waterproof. It isn't bottomed. You can't dye it very well or do anything else with it. In order to get some kind of an absorbent bottom on cotton, for example, and in order to reduce the amount of peroxide that is necessary to get the cotton we began to experiment with a little caustic in the silicate peroxide solution and that indicated that we were on the right track.

Mr. Sokolinski—For example, if you are bleaching with sodium peroxide and neutralize it and then carry it over slightly with sodium peroxide, you would get a certain amount of caustic there, and then you would follow that up with silicate?

Mr. Smolens—That is right. The only trouble with that is that the caustic should be put in after the silicate is there.

You can disperse caustic soda in a silicate solution, but you can't disperse silicate of soda as easily in a caustic solution.

I got this from the Philadelphia Quartz Company. It isn't original with me.

Mr. Sokolinski—I asked that because I believe the original kier bleaching was done quite a few years ago at E. R. & H.

Mr. Smolens—There was caustic in the solution all right but—

Mr. Sokolinski—I guess they were really the pioneers in that. That is what made me ask the question. I thought you referred to the fact that that was the beginning of kier bleaching.

Mr. Smolens—No, I think that was the beginning of kier bleaching that turned out a bottom on cotton goods which could be given fast, high-speed dyeing, for instance, hatter dyeing, without more resist than you get in any other process.

Mr. Sokolinski—In regard to silk hosiery, where you talk about bleaching with the gum in it, do you mean to have a certain per cent of alkali, that is, to boil and bleach in one operation with the cotton and silk?

Mr. Smolens—Yes.

Mr. Sokolinski—How strong an alkali would you have? Would you have a certain percentage of soap?

Mr. Smolens—Some people use soap. Personally I prefer sulphonated oil because under ordinary conditions I think that a sulphonated oil is a great deal more stable than a soap.

Mr. Sokolinski—Where you had this splicing in the heel, where you had it protected, that is, your cotton heel with the silk over it, how did your white come out in the splicing?

Mr. Smolens—It can come out fine. I don't say it always does, but it can.

Mr. Sokolinski—You bet your life it doesn't always.

Mr. Smolens—But it is being done.

Mr. Sokolinski—What made me mention that is the fact that we did a lot of work with it. We found that by originally boiling it and then bleaching it with a certain percentage of silicate, you could get it absolutely perfect each time without any difficulty.

Mr. Smolens—That is a long process, boiling off first and then bleaching.

Mr. Sokolinski—You can bleach it in three hours and boil it in an hour and a half to two hours.

Mr. Smolens—You can take the gray stockings and throw them in the machine and take them out in less than an hour sometimes with the same bleach, and you save yourself the trouble of handling. And it isn't a satisfactory process to bleach boiled-off hosiery in one of these monel machines. If you have to boil the hosiery off or if you want to boil the hosiery off in a machine, you will get a better job if you bleach them by steeping or immersing.

I have seen some very fine work done by the boil off and bleach process, just as good as any other work I have ever seen. I think it is safer to do it the other way with the ordinary help that you have in the dyehouse, but where it is a cost proposition you can get just as good work in the boil off and bleach as you can by boiling off first.

Take silk and cotton fabrics like cotton-back satins; there is one company that produces a great deal of cotton-back satin and they use very low-grade cotton. By "low-grade" I mean it has a lot of motes in it. So that these motes have to be pretty well bleached out in order that they won't show through the dyeings, especially when the demand is all for light shades. If you boil that off first and then try to bleach it you are very likely to injure the silk, by chafing and friction, or scratching, or one thing or another. So all of that particular class of goods is being boiled off and bleached at the same time.

Mr. Sokolinski—I just had reference to hosiery.

Mr. Smolens—I think the modern method of handling hosiery is boiling off and bleaching at the same time, and that isn't because I think it is better. In fact, I think it is better to do it the other way, from the standpoint of quality, but in a great many dyehouses the boil off and bleach process is turning out fine work.

Mr. Sokolinski—How high would you have your alkalinity?

Mr. Smolens—That depends. You must have alkali and you must have some form of oil. Whether you get it in the soap or sulphonated oil doesn't matter. If you have it in the form of soap you must allow for the alkalinity of the soap. If you have it in the form of oil you can get it almost all in the oil solution. The amount of alkali that you have is determined entirely by the alkalinity that is required to bleach the cotton. If you have a hard-to-bleach cotton you must put a lot of alkali in there, or a lot of peroxide, and of the two you are just as likely to get into trouble with a lot of peroxide as you are with a lot of alkali.

If you must have a lot of alkali in a boil off and bleach process on silk, you must vary your oil so as to keep the gum on that silk until your cotton is bleached, because an alkaline solution will not boil off alone. It will not boil off silk very quickly. Then you balance the oil and the alkali to get a bleach on the cotton before you take the gum off the silk, and a couple of minutes after the gum is off the silk, which result is obtained by practice, you drop the liquor, because if you run it long after the gum is off the silk will turn yellow.

Henry F. Herrmann—Speaking of acid dyes, you just mentioned that silk might turn yellow under bleaching conditions, paralleling the turning of wool. In the case of wool, you suggested that it might be an acid dye which came out of the wool. Is there something in common between silk and wool, or possibly other fibers? It seems

to me that one occasionally runs into other cases of overbleaching where the desired end is passed and the goods will turn either cream or brown or some other miscolor, which isn't wanted, and where it may be a little bit far-fetched to believe that an acid dye in the sense that we know acid dyes has been formed. Or is that just a name that you give to a by-product?

Mr. Smolens—This was a suggestion made to me. I know very little about dyeing. In the course of a great number of experiments on wool we purposely produced that result in order to see what we could do with it. Overbleaching is possibly a matter of overoxidation, or oxidation of a fiber. Instead of stopping your oxidation with the material that you want to remove from the fiber, you have oxidized the fiber. If that is the case, a hydrosulphite treatment or some reducing treatment should bring that fiber back to its original condition or should destroy it altogether.

I have had any number of reports on cotton bleaching, on hosiery bleaching, silk and cotton hosiery bleaching, in which the silk turns yellow. In some cases we think it is because there is too much peroxide, because the alkalinity is low; in other cases we think there is too much alkali.

I know of one case where the silk turned yellow in our boil off. The pH was about 7.4. And they couldn't budge it. They couldn't bleach it. They dyed it, of course.

Mr. Herrmann—If you say that you can counteract overoxidation by applying a reducing agent wouldn't it be possible to strip off anything that could be called a kin to an acid dye by using the usual stripping agents, either an alkaline treatment or the opposite bleach?

Mr. Smolens—We have tried that. Of course, we haven't tried it with such severity of treatment that it might injure the fiber, but just enough to remove that color.

Mr. Herrmann—We are always interested in fast dyes. I though perhaps there was a new one discovered. (Laughter.)

Mr. Smolens—That is fast, all right.

Chairman Gaede—I am sure we are learning a little more all the time from these discussions. I have a question that I would like to ask you, Mr. Smolens.

Is it practical to bleach and boil off at the same time in woven crepe goods, silk goods?

Mr. Smolens—All silk?

Chairman Gaede—Yes; with peroxide.

Mr. Smolens—I would say that all silk goods could be boiled off and bleached at the same time, but what would be the advantage of doing that?

Chairman Gaede—Well, I thought if there was an advantage in doing that in hosiery there might be some advantage in doing it here—

Mr. Smolens—It is only the hosiery that has cotton in it that is handled that way.

Chairman Gaede—Oh, I see. That is a different matter.

Mr. Smolens—All silk hosiery if it is made out of a good silk doesn't have to be bleached at all. It is boiled off and tinted and it is a sufficiently good white in most cases. Is that right?

Mr. Zisman—I didn't quite get the question. Did you say all silk?

Mr. Smolens—If you should get a lot of all silk hosiery without any cotton, even in the seam, that was made of a good grade of silk—

Mr. Zisman—You mean white silk?

Mr. Smolens—Yes. You wouldn't bleach it in that case, you would just boil it off and tint it.

Mr. Zisman—That would be sufficient.

Chairman Gaede—What I meant, Mr. Smolens was the yellow gum silk.

Mr. Smolens—Doesn't the color come off when you boil it off?

Chairman Gaede—Yes, but still there is a little tint of deep cream color in some cases which will not make a pure white by tinting.

Mr. Smolens—There is a possibility in a case like that that it might require so much peroxide to bleach the color out of the gum that it would hurt the silk.

Chairman Gaede—Yes.

Mr. Smolens—I have never had occasion to try it myself, and I have never heard of any all silk materials being boiled off and bleached at the same time.

Chairman Gaede—In sewing ribbon on blankets, woolen blankets, or in sewing taffetas, for instance, on a fine grade of wool, for quilts and quilted materials, when the wool is bleached with bisulphites they often leave some acid in the wool so as to keep the bleach permanent. That acid or bleach that remains in there often discolors the silk. That acid is unnecessary in peroxide bleaching, isn't it?

Mr. Smolens—Let's put it this way: that all wool that is bleached with peroxide takes on a cream shade. If you want what is known as a "snow white" on wool you have to take the peroxide bleached wool and give it an aftertreatment in the form of some sulphur dioxide treatment and then possibly tint it. But all sulphur dioxide treatment on peroxide bleach is with sulphuric acid so that the wool is acid. If the wool is to remain in a creamy white form, it is desirable to sour before drying, because wool out of even a mildly alkaline bath will concentrate the alkali in drying and come up harsh, maybe brittle, and sometimes tender.

Chairman Gaede—We are troubled very often with silk that is sewed on fine grades of wool discoloring, and we didn't see the reason for leaving as much acid as they did in the wool. Perhaps in some cases it is necessary, though.

Mr. Smolens—Ordinarily, the acid can be controlled in such a way that there is just a trace. You can sour wool in an acid bath, even sulphuric acid, so that when the wool is soured that bath will have a pH of not under 6.5 or 6.6 and your wool will be perfectly all right for dyeing.

Chairman Gaede—Thank you.

Are there any other questions?

Walter E. Hadley—Did I understand you to say, Mr. Smolens, that in bleaching with peroxide and using sodium silicate the goods came out more or less waterproofed?

Mr. Smolens—I didn't mean "waterproofed."

Mr. Hadley—So that they were repellent to dyes, so that they wouldn't be a proper base for dyeing. And if so what would be your theory in regard to that condition?

Mr. Smolens—My theory, which is not mine (I simply state it as the point of view of a great many bleachers with whom I have discussed the matter), is that a silicate peroxide bleach on gray goods which have not been boiled is simply a painting job. You bleach the color but you don't take off the waxes, for example, and it is the natural waxes of oils on the cotton that produce the resist.

Mr. Hadley—Would you call that a bleach?

Mr. Smolens—It is white. You get a perfect white on cotton goods with silicate and peroxide if you use enough of each, and if you heat it long enough.

Mr. Hadley—How high would you heat it?

Mr. Smolens—I would say, boil it. I don't believe you can get a good, economical bleach on cotton unless you boil it—212 deg. It is possible to bleach cotton at 140 if you give it enough time. It is possible to bleach cotton cold if you give it enough time. But in order to get a quick process that is reasonably inexpensive you ought to boil the cotton, because you can get a bleach on cotton by boiling that you can't get at 160. We believe in boiling all cottons. There is a great deal of flat lot yarn, flat lot thread yarn, being bleached with peroxide to-day in Tucson machines by boiling for about an hour with a comparatively weak peroxide solution. That solution takes caustic soda. If you try to handle that yarn without the caustic soda it doesn't get white in that time. It might get white if you boil it four or five hours, but if you boil it four or five hours or six hours it loses strength.

Mr. Hadley—With the peroxide, you mean?

Mr. Smolens—With the peroxide and silicate, without the caustic. Of course, if you boil it six or seven hours with the caustic and silicate and peroxide it will lose more strength, which seems to be very important on that type of yarn.

If you have a very low grade cotton with a lot of motes, it is a pretty difficult job to give that a good bleach with peroxide unless you use a lot of caustic.

Mr. Hadley—But you buffer it with—

Mr. Smolens—With silicate, because a solution consisting of caustic and peroxide is extremely unstable. You can't have any peroxide there if you get your temperature over 140 or 150. It starts to go off. And even with the best peroxide solution, when it starts to decompose, you can't stop it.

Mr. Hadley—You wouldn't object to that, would you, in the manufacture of peroxide?

Mr. Smolens—Yes, sir. (Laughter.) We have a hard enough time matching costs as it is, with stable solutions.

Mr. Sokolinski—You say it is merely a "painting proposition." Isn't that probably where the statement comes that there isn't any loss in the material when it is peroxide bleached?

Mr. Smolens—That is right. There is practically no loss in weight in a silicate peroxide bleach if it is done at about 170 or 180.

Mr. Sokolinski—Then that firm, whoever it was, that made that statement, is correct, aren't they?

Mr. Smolens—Yes. But it just depends on your definition of "bleach." If by "bleaching" you mean turning white then it would be an easy job. But take a sateen, or a broadcloth, or a twill, and bleach that so that they can dye one pass in a pattern and then print it on top of that—you can't do that with just peroxide and silicate at anywhere near a cost that anybody could afford to work on.

Dr. Jos. F. X. Harold—Has anything been done in the activating of hydrogen peroxide in the textile industry comparable to the use of ferric oxide in the bleaching of furs?

Mr. Smolens—By "textiles" you mean silk, wool and cotton?

Dr. Harold—Yes.

Mr. Smolens—Ordinarily, it is not necessary to activate the peroxide in textile bleaching. I think what you have in mind is a coal composition, coal bleaching, and you also have in mind the fact that the fibers that are being bleached are extremely sensitive to alkalinity, even at temperatures of 100 or 110, but most of the textile fabrics that we have to handle—wool, for instance—are bleached at temperatures of over 110. Cotton is bleached at a boil. Silk is bleached at a boil or close to a boil. Tussahs are actually boiled.

Dr. Harold—I don't mean to initiate decomposition.

By "activity" I mean to do efficient work at low temperatures and with the least possible molecular liberation.

Mr. Smolens—The only thing we have done along that line is in some grades of cotton where we use a very large amount of caustic soda. But we haven't used any of the salts which you have in mind. There are others that are even more effective than ferrous sulphate, but there isn't very much known about that kind of process and the people who do know it won't say anything about it.

Dr. Harold—Almost any metal that has two states of oxidation will do that trick.

Mr. Smolens—We find that on equipment. We find on some types of steel equipment that there seems to be a continual changing of the iron from ferrous to ferric and back and forth, and it is almost impossible to do any peroxide bleaching in some kind of iron equipment. Other kinds of iron equipment after a while become perfectly inert. But the manufacturers of kiers tell me that they have the same trouble in coating kiers. In some bleacheries they can't keep a coat on a kier. In other bleacheries they just dump in a little slack lime and circulate it and they get a perfect coat that never comes off.

Mr. Hadley—I recall several years ago I was bleaching a lot of cotton-silk hosiery and after the boil off it seemed to clear up in fairly good shape. We put it in peroxide liquor and it commenced to develop brown spots. We took it out and washed it and tried to retreat it, and every time we tried a new bath it commenced to get worse. After about three or four lots we went into black.

Do you have any theories about what those spots were?

Mr. Smolens—Were they metallic?

Mr. Hadley—No. There was no metal in contact.

Mr. Smolens—Was there any chance of the oils in the soap getting on the hosiery—which might be colorless but would be oxidized into a brown color?

Mr. Hadley—That might be possible. We assumed, however, that they were clean.

Mr. Smolens—When there is any trouble in bleaching anything which develops spots, that gives a chance to trace back to the cause, and that is fine. But when we get a hole that doesn't have any spot or trace of any cause, then we don't know what to do with it.

Mr. Hadley—They were in laundry bags. I should think the bags would have kept them out, wouldn't you, Johnny? (Laughter.)

Mr. Smolens—I remember one case in Reading, where they bleach ten or twelve numbers in the same vat. All the numbers came out perfectly except one and that came out with a lot of holes in the silk. There were no stains, spots, or anything. That continued for about a month. Then it disappeared, and every year in the first two weeks of June they get holes in that same number. (Laughter.)

That sounds like a fairy tale, but it isn't.

Mr. Hadley—I saw a lot of cotton silk hosiery up the line and I found the cotton afterward, but the silk was gone. We had the clothespins left and the cotton but the silk was gone.

Mr. Harold—It wasn't windproof, that's all. (Laughter.)

Mr. Smolens—That reminds me of a cotton bleacher who knew that peroxide was all right for bleaching silk hosiery. His wife was wearing hosiery that summer so he took all the stockings that were beginning to turn a little yellow and put them in a kier, and he found the toes and the heels and the seams but he didn't find any silk. (Laughter.)

Chairman Gaede—Are there any further questions? We have time for one or two more.

Mr. Zisman—I would like to ask Mr. Smolens another question. This does not bear on bleaching, perhaps, but it has to do with it.

In your experience have you discovered anything that can be used after you bleach, let's say, stockings (that is what I am particularly interested in) to prevent mildew, that is, within a reasonable time, of course? I mean they have a tendency to mildew a little faster than just a dyed stocking perhaps. At least, that has been my experience. If they have to lay around wet for a few days, they mildew. Is there anything that you would put into the bleaching bath or use afterward to prevent that?

Mr. Smolens—There is only one case of anything like that that I know of and they put phenol into the bleach solution.

Mr. Zisman—You mean anything that won't affect the white, of course.

Mr. Smolens—That doesn't affect the white. I know they put phenol in there because one of them told me, but I don't know how much they used. I understand that some of the hydrogenated oils that Newport sells are effective for the same purpose, but ordinarily the mildew that I have had anything to do with has been on the stocking before it was bleached.

Mr. Zisman—I am not referring to that. I find that white silk (it is also true of cotton) will after it is bleached have more of a tendency to mildew, or to get faint little bluish mildew spots, than other goods. Even other goods would mildew after a time in damp weather, or warm weather, but bleached goods have more of a tendency to do that. Have you found that so?

Mr. Smolens—There is only one case I know of that is anything like that, and I don't know whether the goods were lying around wet or not. It was on children's and infants' hosiery, silk and cotton. They were boiled off

and bleached in a monel machine, as far as we could determine, and it was impossible to determine whether they had been lying around wet or not, but they were dried, finished, packed and shipped out. Three or four months later they began to come back with little purplish spots. They made some bacteriological analyses on them and the bacteriologists claimed that it was mildew.

Mr. Zisman—That probably was due to the fact that they got wet. They got wet afterward, or damp, because if they were dry I doubt very much whether the bleaching would have any effect.

Mr. Smolens—They were dried or they wouldn't have been shipped out. This particular mill examines their goods very thoroughly because they get a tremendously high price for their stuff. We never did find out what it was due to.

Mr. Zisman—I think probably I can account for that in this way: It happens that those spots are so faint sometimes that even on close examination you can't see them, and you dry the goods and the spots develop on storing, once they have started. If they have not started, nothing will develop.

Mr. Smolens—Fortunately it was only one lot that came up that way in the last year and a half. But there is one mill in Reading that is proverbially troubled with mildew on bleached stock. They put some carbolic acid right in the bleach bath, but they think it is such a valuable trick that they won't tell anybody anything about it. (Laughter.)

Chairman Gaede—Are there any further questions?

I am sure there is no room for doubt that this was a very interesting paper and also a very interesting discussion. I will call for a rising vote of thanks to Mr. Smolens. (Applause.)

. . . The meeting adjourned at nine-thirty.

Tentative Program

The following is the tentative program of the New York Section of the American Association of Textile Chemists and Colorists:

January 24, 1930, *Paterson, N. J.*

Mr. C. H. Clark, Secretary-Treasurer, Textile Research Council—"Textile Research Council Program."

February 28, 1930, *New York, N. Y.*

Dr. Hans Meyer, General Dyestuff Corporation—"The Dyeing of Vat Colors on Wool."

Mr. N. D. Harvey, Jr., Carbide & Carbon Chemicals Corporation (Pittsburgh Laboratories)—"New Solvents and Their Relation to the Textile Industry."

March 28, 1930, *Paterson, N. J.*

Mr. Takamine, Takamine Laboratory, Inc.—"The Relation of Enzymes to Textiles."

Mr. Ralph Wechsler, Technical Director, National Oil Products Company, Inc.—"Researches in Textile Oils."

April 25, 1930, *New York, N. Y.*

Mr. R. A. Gale, Wallerstein Company, Inc.—"Rapidase and Its Practical Application."

Hercules Powder Company, Inc., Naval Stores Department—"Pine Oils." (Speaker to be assigned.)

May 23, 1930, *Paterson, N. J.*

Surprise Program and General Election.

HENRY F. HERRMANN,
Chairman, Program Committee.

NOVEMBER MEETING OF RHODE ISLAND SECTION

The November meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists was held on Friday evening, November 29, at the rooms of the Providence Engineering Society.

Richard B. Earle, Chairman, presided.

Harry A. Crown, a member of the technical staff of the Corn Products Refining Company, gave an interesting talk on "The Manufacture of Starch, Dextrine and British Gum and Its Application."

About thirty-five members were present.

A. NEWTON GRAVES, *Secretary.*

SOUTH-CENTRAL SECTION

The fall meeting of the South-Central Section, A. A. T. C. C., was held at the Patten Hotel, Chattanooga, Tenn., on Saturday evening, November 9, about thirty members being present.

Most of the meeting was taken up with business discussions. No formal paper was presented. Mr. Noel White explained to the members the controversy on the weighting of pure silk, and in addition one or two dyehouse problems were presented.

The Nominating Committee elected to report at the next meeting is as follows: Robert D. Sloan, chairman; Noel D. White, R. S. Wheeler and William J. Kelly.

Applicants for Membership

Active Membership

Barre, Walter W., salesman and demonstrator, Geigy Company, Inc., 89 Barclay Street, New York, N. Y. Sponsors: W. H. Wingate and Daniel P. Knowland.

Chambers, Ivan F., research chemist and demonstrator, Du Pont Company, Technical Laboratory, Box 518, Wilmington, Del. Sponsors: Lawrence F. Ryan and Eric J. Monaghan.

Crosby, Clifford C., dyer, Wm. Knowlton & Sons Company, West Upton, Mass. Sponsors: G. L. Armour and John C. Tebbetts.

Graham, M. Phillips, salesman, Newport Chemical Works, Inc., 80 Broad Street, Boston, Mass. Sponsors: W. H. Zillessen and Alex Morrison.

Harand, Walter, head dyer, Sussex Print Works, Newton, N. J. Sponsors: Leonard Minikin and Kenneth A. Brownell.

High, Reynold G., overseer of dyeing, Millville Manufacturing Company, Bleach and Dye Works, Millville, N. J. Sponsors: G. H. Newcomb and W. G. Hamlin.

Newell, Richard F., salesman and demonstrator, Ciba Company, Inc., 478 Drexel Building, Philadelphia, Pa. Sponsors: R. H. Skinner and Emil Hansen.

Pine, Louis, chemist, American Fur Dyeing Company, North Bergen, N. J. Sponsors: Joseph Caspe and Alex Morrison.

Reichman, Murray J., color mixer, Screen Printing Department, United Textile Print Works, 36-21 Thirty-third Street, Long Island City, N. Y.

Sacks, John M., manufacturing chemist, E. I. du Pont de Nemours & Co., Box 928, Wilmington, Del. Sponsors: Eric J. Monaghan and Lawrence F. Ryan.

Slowinske, George A., research chemist, E. I. du Pont de Nemours & Co., Wilmington, Del. Sponsors: Lawrence F. Ryan and Edward H. Gamble.

Staab, Edward H., salesman, National Aniline & Chemical Company, 40 Rector Street, New York, N. Y. Sponsors: W. A. Holst, Jr., and Charles C. Knight.

Stanley, John M., dyer, Proximity Print Works, Greensboro, N. C. Sponsors: Richard M. Mitchell and H. N. Myers.

Swanson, Barrett B., textile chemist and colorist, Geigy Company, 89 Barclay Street, New York, N. Y. Sponsors: W. H. Wingate and Daniel P. Knowland.

Von Bergen, Werner, textile chemist, Forstmann & Huffmann Company, Passaic, N. J. Sponsors: W. H. Wingate and Daniel P. Knowland.

ASSOCIATION BADGES

The lapel button badge illustrated herewith is worn by members of the American Association of Textile Chemists and Colorists.

The three "rings" are enameled in red, yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

ALEX MORRISON,
American Woolen Co.,
Andover, Mass.

AMERICAN DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
Professor of Chemistry and Dyeing, Lowell Textile School
Directing Editor

WILLIAM HOWES COLLINS
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IMPROVING THE ANNUAL MEETINGS

EVERY annual meeting of the American Association of Textile Chemists and Colorists has disclosed ways and means of making more effective the meetings that have followed. Each year the lessons of previous meetings have been applied toward rendering these annual gatherings more enjoyable and more instructive to an increasing number of members. These improvements, it is hoped, will continue to be made every year. Those new devices which helped to make last week's meeting in Philadelphia so successful will surely be carried along in next year's program at Boston.

Many of the improvements and methods have justified their retention as a permanent part of the program of Association meetings. The Open Forum is an obvious illustration of an idea which was first tried as an experiment a few years ago and, having proved its value, is now retained as not less essential to the meeting than the Council and Research Committee meetings. The latest plan for speeding up the machinery of the annual meeting was the publication in the REPORTER of abstracts of the technical papers in advance, supplemented by a list of almost all of the topics voted upon as suitable for discussion at the Forum session.

Making available to members and other readers the abstracts of papers helped unquestionably to keep the program moving forward smoothly and without loss of time. The idea has been practiced by the American Chemical Society for many years. As a permanent feature of the proceedings it certainly should prevent excessive crowding at the meeting, for it enables members to decide more easily what papers they want to hear, and what papers they will best be able to discuss. As a consequence, when each speaker steps to the platform he feels assured that those before him are there because they know his paper will interest them, and while in some cases this may tend to reduce the audience, yet it does save time for those who have no interest in the particular paper being read. At meetings where seating capacity is limited—and that includes most of the meetings so far held by the Association—this is an important aid, eliminating the confusion caused when persons enter or leave during the reading of a paper.

But a more important advantage coming from the publication of abstracts in advance of an annual meeting is that members can be prepared to discuss the papers they listen to. The mere title of a paper very often does not convey enough information to inform members before the meeting as to the exact contents of a paper. An abstract does inform them of this. It should send them to source material for data to use in discussions.

It is not necessary to enlarge on the truth that discussion is the very blood of every annual meeting, not to mention local section meetings held throughout the year. The mere reading of one paper after another has, after all, little value, for the papers are later published in full and may be studied at leisure. But discussions on papers cannot be published unless there is material to publish. Discussions are made by the members as an audience, and therefore usually contribute, in the form of group opinion, far more to the subject than the paper alone.

Discussion may be spontaneous, based on the knowledge carried about by men with encyclopedic minds; but usually it is much more worth-while if some preparation goes into it beforehand. Memories are at best fallible. The abstracts published in the last issue made preparation possible, and while the advantage may not have been taken by all who attended the meeting, undoubtedly the Annual Meeting was made immeasurably more interesting because of the thorough discussion accorded some papers.

THE LEADERS OF INDUSTRY CONFER

FROM the stock market smash, it now appears, there have come certain blessings in disguise. One of them was the blow it dealt to those blind optimists in business who have always relied so heavily upon *general* prosperity that they rarely troubled themselves to chart their own future course intelligently. Too many of these optimists have been living—in a business sense—from day to day, with not a spark of foresight to guide them. Too many believed their plants would keep filling orders month after month despite competition and despite their neglect to keep informed on the actual conditions in the financial center of the country, and on the tariff situation.

But a more important blessing is visible in the rush of industry to gather its clans and talk over ways and means of keeping business more stable in the future to assure steady production and steady profits. The conference held last Thursday in Washington by the United States Chamber of Commerce, attended by two hundred

industrial leaders, brought together the best brains of thirty-two major manufacturing groups. It was the outcome of one of the most important decisions so far made by President Hoover.

Unfortunately this issue of the REPORTER goes to press just as this industrial conference opens, so that no comment can be made here as to the results. But from the published announcements it is possible to draw some interesting conclusions on the effect of such a gathering, not alone upon industrial conditions throughout the country, but more specifically upon the textile and the dyestuff industries. The effects may be more far-reaching than any superficial observer can appreciate. It is no exaggeration to say that the course of business in 1930 may be linked to the program of activities decided upon at Washington last week.

In calling the conference at the request of the President, the Chamber of Commerce demonstrated that it can act as leader in mobilizing the industrial and commercial strength of the nation for some concerted plan of action that will assure a continuance of business momentum—an assurance badly needed at this time. In explaining the purpose of the council Julius H. Barnes, chairman of the Chamber of Commerce, declared that business should and could assume responsibility for this mobilization.

The textile industry was represented at the council table by men prominent in their respective branches of the trade as association executives. On the roster, published a few days before the council met, were the names of W. L. Pierce, head of the National Association of Finishers of Cotton Fabrics; Paul C. Delbry, vice-president of the Silk Association of America; Walker D. Hines, chairman of the board of the Cotton Textile Institute; Franklin W. Hobbs, president of the National Association of Wool Manufacturers, and Walter Humphries, secretary of that association; J. W. Mettler, of the National Association of Hosiery and Underwear Manufacturers.

The participation of these textile executives in the stabilizing plans of President Hoover should be more than sufficient assurance to every individual and mill in the industry that everything is being done to maintain production at as high a level as possible. The influence of this action is certain to be felt in the processing branches of the industry north and south. This is no time for sectionalism.

Furthermore, the dyestuff industry, whose fate is inseparably linked to textile prosperity, may well feel hopeful that such action is being taken to avert any depressing influence which might otherwise have followed a financial crisis like that which was witnessed a few weeks ago. The chemical industry was represented at Washington by Lamont DuPont, president of the Manufacturing Chemists Association; Elon Hooker, president of the Hooker-Electro Chemical Company; H. S. Chatfield, president of the National Paint, Oil and Varnish Association, and others. The coal-tar chemical branch of the industry was not, however, mentioned in the lists of those attending, although undoubtedly this branch sent its observers to the conference. If the REPORTER may offer a suggestion, the present is, we believe, a most opportune time to call a meeting of the Chemical Advisory Committee which functions under the direction of the Chemical Division of the Department of Commerce.

Lest there be any doubt in some minds as to the effectiveness of councils and conferences of industry called to help in the present stabilizing effort, the following facts about current conditions may be cited: There are no large accumulated stocks and commodities as in 1921. There are no inflated commodity prices to threaten plants with losses as eight years ago. There is ample bank credit and a strong banking situation. The reports submitted by the industrial men at last week's conference presented definite information on every manufacturing industry, enabling the Chamber of Commerce to plan ways of improving the weak spots.

In spite of these encouraging facts some persons will continue to predict depression, like the rain-makers praying for clouds to appear. Why some folks enjoy feeling miserable about the future of business will always be one of the deep mysteries of human nature. Is it necessary to emphasize at this time the importance of a hopeful mental outlook and a cool, dispassionate judgment? Because modern industry is so interrelated, no greater assurance could come to those in the textile and the dyestuff industries than the intelligent optimism displayed by the leaders of business at the Washington conference a few days ago.

The Dyer's School of Experience

Silk Skein Dyeing in 1899

By NOEL D. WHITE

THE advent of the coal-tar dyes did not displace the old methods of dyeing overnight, not by a long shot. The first dyestuffs that came out were readily accepted because easy to apply and capable of producing brighter and fuller colors than could be obtained from the old woods, barks and minerals, but were found to lack in fastness until the alizarine dyes came in to help in that respect. For a long time, when fast colors were to be dyed the dyer had to still use the older methods for many shades, using mineral mordants, dye woods and cutch. Dyeing fast colors had at this time become a trade by itself, and the dyer who could use the old formulas and took to alizarine dyeing to increase the number of his shades was considered a superior being by the rest of us, and only

few places were left where that kind of work was carried on. Most dyehouses were satisfied to do only ordinary dyeing with the new dyestuffs.

Having discarded the old formulas, woods, berries and flies as dyeing mediums, the general idea was that dyeing was now an easy matter with the coal-tar dyes that were coming out in great numbers. Colors that took days to obtain could now be dyed in a very short time. One dyer with a vat could turn out four or five more shades a day, using the spent boil-off soap acidified with acetic acid for basic colors and sulphuric acid for acid dyes.

In most dyehouses a man was in charge of dissolving dyestuffs, each in separate tubs, so many ounces or pounds in so much boiling water, and the dyer would get what he needed with a pail or a dipper. Scales and balances were things the silk dyer only laughed at. In many cases that holds true even today, for quite recently an old-timer came to visit in my place of business and, seeing me weighing some color on a torsion balance, said: "I must get me one of those balances." I asked him how could he get by without one.

He said: "I hold the balance in my eye!" Meaning he could judge with his eyes the right amount of dyestuff to take. And, as a matter of fact, that man was right, as skein dyers, and in some cases silk piece dyers, get so proficient in dyeing with the dipper instead of the scales that they get unquestionable results that way.

With alizarine dyes, however, the dyes are weighed out carefully to avoid working the yarn any longer than necessary, and the alizarine dyers work on a percentage scale.

Learning to Dye Fast Colors

I was at this time employed in a place where there was much fast dyeing done—dyeings to be used in weaving umbrella coverings, hat bands, decorations for woolen suitings, embroidery silk and the like—and my job was as assistant to the man in charge of that department, a very nice man who knew his business but who, in accordance with the old tradition among dyers, kept with guarded care all he knew about his methods of working. After more than a year with him I knew the names of the mordants used and the colors of the dyes by sight, but not the names of any of them. The minute the alizarine dyes entered the dyehouse they lost their identity to become numbers, and when a red was in process of dyeing I was told to go get so many pounds of No. 10, and if it was a purple or a green then it was No. 15 or 42, and so on. Of course, I was not surprised at that system; in the other departments it was the same way—every dyestuff had a number; for what reason I have never been able to find out. I was led to believe it was to keep secret the names of the dyestuffs, so that a worker leaving one plant to go to another would not be able to tell what dyes they used in the place he left; but my opinion was that, so many very able dyers being illiterate in those days, it made it easier for them to read and remember the numbers, while they could not read the names. Whatever the reason, in this department I was sure it was to keep it secret, and one day I said to the dyer: "Why don't you show me how to do this work and let me learn the names of all these stuffs we are using? I am here over a year now and I know no more than when I started. You may get sick some time and then I will be able to carry on until you are well again." I had noticed he did not look well, but did not expect what he answered me.

He said: "My boy, I am a very sick man already and expect to go to a sanitarium until I feel better; but I have not money enough. I wonder if you could help me? For twenty-five dollars I will show you all you want to know about our work and I will also give you a book full of instructions so you will be able to do this work yourself."

Twenty-five dollars was a lot of money for me in those days and I did not know how I could spare it, but I told him I would try to find it for him. Out of my wages I was saving a few dollars every week to buy me a bicycle, and had enough saved that I figured by the next pay day to be able to get it. I got out my little bank, counted out twenty-five dollars and postponed the buying of the wheel to a later date. The next day I handed him the money. He took it and, with tears in his eyes, he tried to make me understand how he hated to take my money, in what dire circumstances he found himself at present and the need of his going away as soon as possible to try to recover his health.

The end of that week he left. He had no need of showing me how the work was done, but the little notebook he left in my keeping was, in my eyes, the most invaluable treasure. In it I found the number of every dyestuff opposite its name and the name of the manufacturer of it; also a lot of recipes for making and preparing the different mordants we were using and many others; also a lot of other stuff I thought would be useful at some future time. I did not know whether that notebook was all he had and whether he wanted it back on his return, but that night I bought a blank book and copied all that was in the old book and put it away.

The next Monday I took charge of the department. The boss came to ask me if I thought I could run it until the other man came back. "Yes, sir," I said; "I have the whole dope, and just watch me." He shook his head and left, but I went right ahead.

Taking Charge of Too Big a Job

Here is how we did that alizarine dyeing: The silk was brought to us already boiled off in the usual way,

washed and whizzed. We had to mordant it before dyeing with the alizarine, and there was a mordant for light and bright colors and another for dark shades. Acetate of aluminum for light colors was prepared as follows: 14 pounds of rock alum and 7 pounds of acetate of lead were boiled together until dissolved in 20 gallons of water; then a pint of acetic acid was added, stirred well and the solution left standing to settle. The aluminum mordant bath was kept in a special vat and additions were made to a strength of 8° Bé. when needed, using the clear solution from the above mixture. The silk was put in this bath and left overnight. In the morning it was wrung out by hand, washed and given a bath of silicate of soda, cold, for half an hour and washed again. It was then ready to dye. Dyeing was done in the spent boiled-off soap, using half a vat of soap broken with acetic acid and the vat filled with cold water. The alizarine was stirred in a kettle with boiling water and strained into the broken soap bath and dyeing started at 30° C. for five turns, then the bath heated to 45°, then to 60°, then to 80°, and finally to a boil. By this time the shade wanted was supposed to be obtained; and it generally was, as for each shade we had the formula was carefully prepared and the alizarine dyes weighed out with precision. Usually one color only was needed for each shade and the same alizarine would do for several shades. Five per cent Galleine W Powder would dye a light wistaria, 10% for a medium, 15% and 20% for darker shades. After dyeing, the silk was washed and then given two boiling soaps, with 25% olive oil soap in each, then washed and scrooped with acetic acid. Dyeings obtained this way were guaranteed to be fast, and they surely were.

Some formulas used for different shades dyed with alizarine will be found quite interesting. It has cost me $25 to learn how to do it; but now I feel I have no further use for them, so the reader can have them and copy them in his little book if he believes he may use them some time.

With aluminum mordant:

For violets: Alizarine Cyanine RA, 5, 10, 20, 30%, according to shade desired; mordanted as above and dyed same as with Galleine W Powder.

For redder violets: Alizarine Cyanine RRR; proceed as with Cyanine RA.

For orange: Alizarine Orange.

For bright reds: Alizarine Red.

For blues: We had a dye that was dissolved in alcohol, called Coelamine Blue. This was used in a broken soap bath with sulphuric acid, without any previous mordant, in proportions according to shade. Coelamine Blue was also used as a bottom for dark greens, navy blues and plum shades. For dark shades a mordant of chloride of chrome was used. This was a greenish liquid that gave to the silk a sickly greenish color and could only be used for dark, subdued tones. It was prepared by saturating a solution of chromic chloride with chromic hydroxide and filtering. It was used at 8° Bé. and operation carried on same as with the aluminum mordant, silk steeped in it all night, then washed and a bath of silicate, washed again and prepared to dye it.

With chloride of chrome mordant were dyed the following shades:

From apple green to dark olive with 3, 6, 15 or 20% of Alizarine Ceruleine S Powder.

For maroon: With Alizarine Orange.

For garnet and dark reds: With Alizarine Red.

For navies: The silk was first given a bottom of Blue Coelamine, washed and mordanted with chloride of chrome, then dyed with galleine to shade.

For plum colors: Also bottom of Blue Coelamine, then mordanted with aluminum mordant and dyed with Alizarine Cyanine RA.

For dark green and myrtle: After a bottom of Blue Coelamine the silk was dyed without mordant in a boiling soap bath to shade with Red Nitrosamine Paste. Some beautiful shades of golden yellow were also dyed with Red Nitrosamine. This dyestuff was used in a natural olive oil soap bath. Why it was called a red and dyed yellow was a mystery to me until after a good many years, when I had occasion to regret using it for what I thought were very fast colors for scouring and fulling. Will have more to say about this later.

Some of the fast colors were still dyed in the old-fashioned way with iron, chrome, sugar of lead, cutch, etc. A beautiful line of yellows were dyed by mordanting the silk two hours with a 10% solution of acetate of lead (sugar of lead) dissolved and let settle until clear and cold, and then in a boiling bath of 10% bichromate of potash. By passing the silk from the acetate to the chromate from two to four times the shade desired was obtained and the silk then washed clean, soaped at the boil twice and soured with acetic acid.

A line of beige and castor shades was obtained by working the clean silk in a bath having a strength of one-tenth to 1° Bé. of cutch with 1 to 2% of bluestone (sulphate of copper), starting at the boil and working until the bath cooled down to 40° C., then washed and in a cold bath of pirolignite (iron acetate) about 2° Bé. for seven turns, washed and then again put in the cutch bath. The right shade was obtained by using the cutch, the bluestone and the pirolignite in different degrees of strength. Then the silk was washed and soaped twice at the boil, same as for alizarine dyeing, and soured.

A dark shade of maroon used for weaving umbrella covering was dyed first in a bath of cutch standing at 1° Bé. with 2% of bluestone at the boil for two hours, then in another boiling bath with 8% of bichromate of potash. The silk was then washed and again worked in the first bath for about one hour, washed, soaped at the boil and soured.

A Lost Opportunity

As will be seen, there were many kinds of dyeing at that time. While working with the old dyer I had learned all the manipulations and was now carrying on the work alone while he was away trying to regain his health, but after a few weeks we learned that he had passed away. He had waited too long and a malignant disease had gotten the best of him. I felt glad that I had been able to help him, but now that he had gone I wondered if I could hold this job. My employer decided that question for me.

About a week later a Frenchman came in and assumed charge of my department. I went to the boss and asked him if I had not given satisfaction, and was told that I was too young and had not had enough experience. I was also told that the man they had hired was an expert, well educated, and I should try to learn all I could from him. Disappointed and brokenhearted, I was now ready to quit after over ten years in dyehouses, doing, according to my judgment, as good work as any dyer I knew. To be cheated out of a position I thought I could hold was surely a blow to my pride; but in those days it took a good dyer to hold down a position of responsibility in the dyehouse, so I pocketed my pride and, resigned to my fate, decided to stick and learn what was wrong with me.

It was not long before I found out that my technical education had been sadly neglected. In my school days, when I should have been studying from the old tomes dealing in mathematics, physics and chemistry, I had found more pleasure in reading trashy and useless literature, and now I regretted the hours spent in athletic clubs, dancing halls and poolrooms; but I made up my mind to waste no time in pitying myself, but set to work to regain the lost ground. Disregarding the jeers of my boon companions, I enrolled in a school where I could study in my spare time, and from then on I kept to my studies regardless of time, location or environment, keeping the lesson on hand in my pocket, studying at lunch, in commuting trains, in spare times at my work. Keeping everlastingly at it keeps me young, but never satisfied. I can now look at my employers and tell them, without fear, what the terms for my services are.

Teaching the New Boss a Lesson

To return to my new superior, he sure had the knowledge; but while he could make me feel his superiority, I made it my business to let him know that I was by no means afflicted with an inferiority complex. In accordance with the rule, he was as secretive as the rest of the dyers; but now I cared less, for I was in possession of the secrets of the other dyer and so far the new man had shown me nothing I did not know. A little incident occurred, however, that showed he could learn something even from me.

He was finishing a lot of dyed silk with soft finish —that is, a finish without scroop. To do that we usually took some olive oil in a dipper, poured over it the same amount of sulphuric acid, and stirred it with a glass rod until the sulphonation was deemed sufficient, and the moisture was poured in a tub of warm water and kept stirred by lifting the dipper full and letting drop in a cascade back in the tub, up and down until every particle of that burned oil was thoroughly dissolved. A simple operation every dyer knew how to perform. When this man asked me where the sulphuric acid was, I showed him the carboy where every dyer in the place went in need of it for his dyeing bath. I knew what he wanted it for, but he was so conceited he thought nobody but himself knew how to prepare that finish so I thought I would have some fun watching him. He took his olive oil, poured over it his oil of vitriol from the carboy, and proceeded to work everything according to Hoyle. When he poured his mass in the warm water his face became a puzzle. I was watching him from the vat where I was working. He started to swear softly in French, then he threw the solution away and proceeded to make another one. When he poured this second one in warm water the swearing became explosive. "Sacre nom d'un chien!" he yelled, and in no time the surrounding atmosphere became permeated with fire and brimstone. I thought now to go to the rescue. I asked him what was wrong. He said the oil was no good, the sulphuric acid was no good, the all "maudite maison" was out of order.

"Why, Mr. S——, there is nothing out of order here. Tell me what you want to do and maybe I can help you."

"What do you know about this? I want to make some Deux Huiles (the French name for that sulphonated olive oil) and see what I get!"

"I see," I said. "That looks like a tub of spaghetti soup. Why didn't you tell me in the first place what you wanted to do? I could have put you straight the first time. We know how to do that; but you asked me for sulphuric acid and I showed you where it was. That is where all the workers go to get what they need; but as they are careless, most of them, and pour it in the hot soap undiluted, to protect them and the goods from getting burned by the exploding acid entering the hot bath we have it diluted for their use. For what you need we have a bottle stored in another place which is 66° strength and I will give it to you, then you will have no trouble with it in making your 'deux huiles.'"

"Well, I'll be d——d."

"Yes," I said; "we are not so green as you thought, eh?"

The American Textile Engraving Works, Inc., of Paterson, N. J., recently formed with capital of $100,000, to operate a local mill, will be represented by Ward & McGinnis, 45 Church Street, Paterson, attorneys.

Technical Notes from Foreign Sources

Review of Progress in Bleaching

M. K.; Textil-Chem. u. Colorist 10, 97 (1929).—While the bleaching of vegetable fibers, after the introduction of chlorine, for a long time brought forth no alterations of procedure worth mentioning, the period since the war has been responsible for entirely new points of view of the subject, originating partly in research and partly through observations in practice; viewpoints which have led to new methods on the industrial scale. The scientific foundations of the newer methods of bleaching consist, on the one side, in a more penetrative understanding of the various bleaching agents, and, on the other side, in the chemical recognition of the foreign substances in the raw fiber, which are to be removed through the bleaching process, in order to attain the finest possible appearance of the nuclear substance, the cellulose.

Bleaching of vegetable fibers, in contrast to that of the animal fibers, takes place exclusively with oxidizing agents, which, through the activity of the "active oxygen" liberated by them, degrade the impurities, by oxidation, to white and principally water soluble end products, as well as to gases (as carbon dioxide). The one active agent of the bleach is the active oxygen which in comparison with the sluggishly acting oxygen of the air, shows true bleaching power. The reason for this action lies in the quantity of energy with which the active oxygen is provided, and through the means of which the oxidative attack upon the impurities of the fiber easily takes place. These quanta of energy vary according to the nature of the bleaching material, so that the same amounts of active oxygen from different bleaching agents do not possess the same bleaching power. Thus, we know that the oxygen atom which splits off from hypochlorous acid carries with it 9,600 calories, and that the oxygen atom originating in the breakdown of hydrogen peroxide is charged with 23,100 calories. This variation in the active oxygen involves, for each bleaching agent, a specific effect, a fact which is pointed out by the combined bleaching methods recently come to the fore and being carried out practically. We have to assume that the different kinds of impurities of the raw fiber are each specially open to attack by a particular bleaching agent acting specifically upon a particular impurity, or else that the degradation products originating in the first stage of oxidation, which are still colored, can be removed or altered to colorless substances better by one or the other oxidizing agent.

The investigation, important from the practical side of the impurities of the fiber, has been advanced by the researches of Russian textile chemists, who undertook an analysis of the kier liquors in order to isolate, if possible, the foreign substances of the fiber. Thus, for example, acidification of the liquors yielded the so-called "black acid," a nitrogenous compound which possesses a peculiar emulsifying power. Prof. Freiberger has been busy with the investigation of the albuminoids of raw cotton, and has succeeded in identifying chemically some of their degradation products. Generally speaking, special interest attaches to the albuminoids, since they are not only oxidized by hypochlorites, but also chlorinated. The result of such chlorination is the so-called chloramines, with which recent researches have concerned themselves. These chloramines, remaining upon the bleached fiber, are able under certain conditions to split off HCl, and in this way to damage the fiber by being the cause of tendering through formation of hydrocellulose. Since the chloramines are not affected by the usual souring after chloring, as are the hypochlorites, it is well to destroy traces of the chlorine by bisulphite or thiosulphate. These substances lead to more sure destruction of the chloramines, and danger from this source is thus excluded. A recent study by Ristenpart has brought forth the interesting fact that a content of ammonia in the chlorine bleach can bring about an absolutely destructive tendering. In practice old hypochlorite liquors can show an ammonia content, which has arisen through degradation of albuminoids by the action of the chlorine.

The technical development of bleaching leads at once to the question of the cold bleach. It has always been a cherished goal of the bleacher to be able to omit the costly boil-off process as far as might be; a method which, through its energetic action diminishes, incidentally, the weight and quality of the goods. The technical carrying out of the idea we have attained in the well-known oxygen cold bleach of Mohr, for which has been devised an apparatus which, though somewhat complicated and costly, still works very well. The title "cold-bleach" is actually not entirely correct, for the method involves not only chloring with hypochlorite, but treatment with a bath of sodium peroxide, whose working temperature lies within 60° to 70° C. The one feeling of uncertainty about the cold bleach method is a fear of possible subsequent yellowing of the finished goods, for one rightly assumes that the bleached organic compounds derived from the foreign substances in the fiber, which may remain as such upon the bleached fiber, may pass during storage, by the action of light and air, into yellow substances, as so many organic substances do. Experience with the Mohr bleaching process has, however, shown that the bleached goods are not altered by storage, so that the danger of yellowing may be treated as non-existent. For the bleaching of colored goods, that is, material which must be thoroughly

pre-bleached before dyeing in light, tender tones (pastel shades), useful procedures have been introduced which avoid any boiling. The secret of such cold bleach methods lies in the use of strong, alkaline hypochlorite liquors, which through their alkalinity can to a certain extent replace the alkali of the kier liquor. If to such a bath be added an efficient wetting-out agent stable toward alkali and chlorine (e. g., Praestabite Oil G), it is possible to cold bleach goods coming directly from the loom, or yarns from the spinning, with the various preparations which have been used still upon them. The goods, thoroughly wetted out with the above-mentioned bath overnight, are well soaped to remove the softened degradation products of the impurities, and then passed several times through a weak chloring liquor.

For souring the chlored and rinsed goods, iron-free sulphuric acid is to be preferred to hypochloric acid, according to practical experience. The fear that calcium sulphate might cause trouble, from the sulphuric acid reacting with bleaching powder, if that were used, has no foundation, since calcium sulphate is sufficiently soluble in water (2 g. per liter) to be removed from the fiber, even if deposited there, by the amount of water which would be used for rinsing. If, however, for any reason one wishes to use the technical hydrochloric acid containing iron, a careful addition of oxalic acid, which keeps the iron from depositing upon the bleached goods by formation of easily soluble double salts of iron, is to be recommended.

To diminish the danger of yellowing of the goods, increased attention must be given to the final treatment as well as the finishing of the goods. For soaping such soaps should be chosen as do not after-yellow upon the goods. Of interest in this connection is a recent patent of Prof. Freiberger, which involves an addition of a little sodium peroxide to the final soap bath. The peroxide has as its task the bleaching, not of the goods, which have already been bleached, but of the colored soap solution, so as to leave a colorless soap upon the fiber. Incidentally, the addition of the peroxide brings about an advantageous after-bleach. In choosing a finishing oil, which is indispensable for the obtaining of a soft, pliable finish, but which may very often be the cause of after-yellowing, stress is to be laid upon a product as light and clear as possible; according to present-day experience light-colored oils show little inclination to after-yellowing.

Among new sorts of apparatus in the bleaching industry we may mention the "Bleaching Osmotor," which has produced surprising results in the bleaching through of thick, even baled, goods. While in the common bleaching apparatus, with circulating liquor, the bleach liquor sometimes chooses for itself the most convenient course through the goods, and so leaves the goods bleached only in certain places (i. e., the goods are not "bleached through"), the Osmotor works with a dropping liquor, i. e., the liquor comes upon the goods in the form of a spray or rain, and oozes through the whole mass of goods by natural seepage downwards. The remarkable efficiency of the method is apparently to be ascribed to the constant replacement of the spent liquor in the fiber by the fresh liquor spraying downward, whereby fresh, active bleach is automatically and continuously being drawn downward through the goods. The force bringing about this exchange of active for spent liquor is so slight that it can be neutralized even by the pressure of a standing bleach bath, as in common bleaching apparatus, so that it naturally cannot develop of itself.

Recently diligent investigators (in especial, Russian and English chemists) have been working actively toward clearing up various fundamental questions in the bleaching process, so that this important branch of finishing will before long be making such advances as have so far been restricted to the limits of the general development of textile technique.

Behavior of Vat Dyeings on Cotton Under Exposure to Light

Dr. A. Landolt; Mell. Textil-Ber. 10, 533 (1929).—It has been for a long time known that undyed cotton is weakened or tendered by exposure to sunlight. It has been shown recently (J. Text. Inst. 1928) that the extent of the damage is to a considerable degree dependent upon the state of purity of the fibers; raw cotton losing 17% in tensile strength and boiled-out cotton 51%, in one series of experiments. Heerman (Mell. Textil-Ber. 1924, 745) ascribes the alteration of the fiber to the action of ultraviolet rays. Kauffmann (Mell. Textil-Ber. 1926. 617) has given to the cellulose material, after alteration by light, the name of photo-cellulose, and adds a procedure by which the substance can be determined analytically.

Dyed cotton has also been subjected to more or less study. It has been found that cotton dyed with yellow dyestuffs is peculiarly liable to damage by the action of light. On the other hand, cotton in whose fibers mineral colors, as chromium or ferric acids, have been deposited, is able to withstand the attack of light to a considerable degree (J. Text. Inst., 1928).

These facts, however, are substantiated only by examining the tensile strength of the goods after a long exposure. A startling fact came to the fore in this connection, namely, that certain dyestuffs, among which were some vat dyestuffs, could bring about weakening of the fiber merely by exposure to light, even during the short duration of the dyeing process. Scholefield (J. Soc. Dyers Col. 1928, 268) has shown, e. g., that all yellow and orange dyestuffs, except Indanthrene Yellow G and Alizanthrene Yellow GR, are able to occasion this weakening of the fiber during the progress of the dyeing.

The author examines the work of Scholefield with some care. He quotes S. as determining that:

1. Damage of the fiber takes place if light acts upon the fiber saturated with the vat liquor, and in slight degree through the action of light upon the dyed material when oxidized but not yet washed.

2. This action is to be ascribed to the hydrogen perox-

ide, which forms even in the dark, by auto-oxidation of the vat dyestuff (leuco), through subsequent exposure to light.

3. Irradiation of a dyeing from a mixture of Cibanone Orange R and Ciba Blue 2B in the leuco form resulted in the destruction of the blue component.

4. Oxidized vat dyeings, impregnated with 0.5% caustic liquor, were not damaged by light, but were so damaged considerably after reduction with hydrosulphite.

L.'s work was directed toward determining more exactly the conditions under which damage could take place, with, of course, reference to the possibility of obviating such damage. His experiments were first limited to the condition of brief irradiation (one hour at the highest). In extended irradiation (e. g., some months), the cotton itself, even under ordinary conditions, forms a complicating factor. He decides that it is not the dyeing, but the sequence of dyeing and oxidation, which is responsible for the damage to the fiber, a necessary condition being that alkali be present. He lays down the following conditions as necessary to the damaging of the fiber:

1. A suitable dyestuff as a catalyst.
2. Oxygen, either as molecular (air) or in labile combination (hydrogen peroxide).
3. Alkali (hydroxide or carbonate).
4. Water.
5. Light or short wave-length (blue or violet).

As to 1, it may be noted that certain yellow dyestuffs, especially vats and sulphurs, are especially active as catalysts, while the direct yellows have no such action. Some exceptions are Cibanone Yellow GN, Cibanone Gold Orange 2R and 3R, Indanthrene Yellow 3RT, and Indanthrene Orange RRN. Red, blue, and violet dyestuffs in general do not act catalytically.

As to 2, irradiation in the absence of oxygen (submersion of the goods under the surface of a liquid) or irradiation of the leuco dyeing in the presence of hydrosulphite, gives rise to no tendering of the material. If, however, material dyed with a catalytically active dyestuff be exposed to light in a weak solution of hydrogen peroxide, together with a sample of the same material undyed, the dyed material is tendered. It is an interesting fact that, after irradiation in the presence of air, traces of hydrogen peroxide are always to be detected. The peroxide apparently acts as a carrier of oxygen; it forms only through the action of light; it cannot be detected in goods dyed in the leuco vat and hung up to oxidize in the dark. Even the dyestuff paste itself is able to give rise to hydrogen peroxide on exposure to light; 1 c.c. of Cibanone Orange R Paste in 100 c.c. of water, to which was added 1.6 c.c. of caustic soda solution of 36° B., on irradiation for one hour in a quartz vessel, under the Fadeometer, gave 0.085 mg. of H_2O_2 (titrated with titanium sulphate and with thiosulphate). It is plain that no peroxide is formed without the proper dyestuff as a catalyst, as also without alkali. Another experiment was carried out to determine volumetrically the amount of oxygen absorbed during the process; 5 g. of cotton material, dyed with 2% of Cibanone Orange R, were covered, in a suitable irradiation vessel, with 30 c.c. of water and 0.48 c.c. of caustic soda solution of 36° B., and the vessel attached to a gas burette, the latter then read. The material was then irradiated for one hour under the Fadeometer with ice cooling. From the second reading of the burette, and the necessary calculations involved, allowing for the amount of oxygen in the hydrogen peroxide formed (also determined), it was found that 1.24 c.c. of oxygen had been used up in the tendering of the material. Those parts of the material which during the irradiation had been exposed to the air in the apparatus showed considerable tendering, and gave a strong test for oxy-cellulose with Methylene Blue solution. This experiment, repeated with undyed cotton, gave only 0.05 c.c. of oxygen as absorbed. Further, similar tests carried out, e. g., with blue vat dyestuffs (not catalytically active—see above) showed neither tendering nor the presence of hydrogen peroxide; and this was true both for dyed cotton and for the dyestuffs in substance.

As to 3, caustic alkali is not necessary; carbonate is sufficient to produce tendering with the proper dyestuff. In one case goods impregnated with a 1% soda solution, after hours of exposure in the Fadeometer, lost 50% in strength. The extent of the damage is proportioned to the concentration of the alkali.

In reference to 4, L. states that completely dry dyeings are not damaged by the short (i. e., one hour) irradiation, even if alkali be present. Obviously in such a case no hydrogen peroxide, the carrier of atmospheric oxygen, can be formed.

As to 5, interposition of glass plates is no protection against the harmful effects of irradiation. (It is not clear whether this fact is or is not directed toward the question of whether it is the ultra-violet element of light, or the visible blue and violet rays which are the cause of the generation of hydrogen peroxide. See above as to the statement that the visible rays are the cause.)

In the case of dyestuff combinations, e. g., Cibanone Orange R with Ciba Blue 2B, the blue component was completely destroyed on irradiation, and the fiber remained protected from tendering.

In all of the above, it is plain that the tendering is merely the result of degradation of the cellulose to oxycellulose, as evidenced by the Methylene Blue test, and by the actual measurement of the oxygen absorbed in the process. It appears that the light components of short wave-length, and in the visible part of the spectrum, i. e., blue and violet, and not (necessarily) ultra-violet rays, are the effective ones. The fiber can be protected against the action of light by impregnation with certain organic substances, as beta-naphthol or toluylene-diamine, and, optically, by shielding with yellow or red light filters, as of dyed Cellophane.

Some work was also carried out by L. upon another phase of the subject, namely, the lack of fastness of

certain leuco vat dyestuffs toward light. The query as to this matter arose through the observation that certain dyestuffs (vats), if dyed in sunlight (not necessarily carried on out of doors, in sunlight, deliberately, but, for example, by accident, under some circumstances, as working in the dyehouse where windows allowed direct sunlight to fall upon some lots of goods, perhaps, and not upon others) are destroyed. The short irradiation (one hour) before employed was used in this study also, and it was found that:

1. The leuco compounds and leuco dyeings of most indigoid dyestuffs are sensitive to light. Those of the anthraquinone series are stable toward light. The first condition means at least that dyeings exposed in the course of dyeing to sunlight certainly become weaker than they should be, and in some cases even become white.

2. This action of light is not associated with tendering of the fiber.

3. The destruction of the dyestuff takes place only in absence of oxygen, i. e., when the goods are completely covered by the bath of vatted dyestuff.

4. The destruction of the dyestuff must be ascribed to a chemical action of light. Interposed plates of glass do not hinder the action. A special experiment of peculiar and suggestive result was carried out by exposing to light a layer of the leuco compound of Ciba Blue 2B, between glass plates. (This dyestuff is a tetra-bromindigo.) When exposed in the manner usual for the testing of dyed samples toward light, that is, with a part covered by a layer of some opaque material, the exposed portions gradually became blue, but it was not the blue of the original dyestuff; a redder blue was formed. The blued portion, extracted with water, gave a test for bromine with silver nitrate solution. Ciba Blue 2B, by irradiation in the leuco form, passes over to an indigo less rich in bromine, while the bromine set free oxidizes the leuco compound to the dyestuff form. This dyestuff, by repeated reduction and irradiation in the leuco form, is gradually destroyed. In this work it was found that proper light filters, as Cellophane dyed red or yellow, prevented or at least hindered this action of light, while filters passing blue, green, or violet light favored it.

The author closes with the statement that his work has not been carried out under conditions met with in practice, but under carefully chosen conditions adapted for the solution of certain definite questions; that it would be wrong to assume that any special difficulties accompany the use of such dyestuffs as were examined on the large scale. The purpose of his study was only to point out certain possibilities of trouble, in order to call closer attention to working conditions prevailing at such points in industrial dyeing.

Improvement in Dyeing of Ice Colors

German Patent No. 433,149; *I. G. Farbenindustrie A.-G.*—The improvement claimed consists in removing most of the padding bath, which adheres to the material superficially, by treating the goods, immediately after padding, or possibly after centrifuging, with a weaker padding bath to which has been added caustic soda and an electrolyte, or, if the substance used for the padding is of a decidedly substantive nature, by simply rinsing in a solution of the electrolyte, to which may be added caustic soda or not as desired, or even by simply rinsing in dilute caustic soda solution alone. This removal of the excess of padding bath makes for greater fastness to rubbing in the finished goods, of course. A further advantage is that damage resulting from exposure of the padded goods to air before developing, by action of the air upon the grounding substance thus exposed in a form particularly liable to attack (wet and greatly extended in surface) is impossible.

Soluble Chrome Dyestuffs for Cotton

German Patent No. 433,148; *I. G. Farbenindustrie A.-G.*—Substantive dyestuffs with groups capable of reacting with chromium salts are transformed by treatment with such salts into soluble chromium derivatives, which are still substantive dyestuffs. A suitable chromium compound consists of 6 mols. of chromium formate, 4 mols. of chromium fluoride, and 1 mol. of chromium sulphate. After dyeing, which is carried out with Glauber salt or common salt in the bath, the goods are slightly rinsed and laid in lime water for a short time.

Acetate Silk Dyestuffs

German Patent No. 433,236; *I. G. Farbenindustrie A.-G.*—1-Amino-anthraquinone-2-sulphonic acid and its substitution products (which would usually be considered as intermediates rather than as dyestuffs) have been found to possess great affinity for cellulose esters. Dyeings are clear, deep, and fast. Derivatives of the amino-anthraquinones-sulphonic acid which contain a free or substituted amino or hydroxy group in the 4-position are excepted.

Blue Vat Dyestuffs—Benzanthrone Series

German Patent No. 442,511; *I. G. Farbenindustrie A.-G.*—By alkali fusion of an ether of hydroxy-benzanthrone, which in the benzene ring are substituted in the 1-position by halogen. In the example given a procedure is furnished for the preparation of one of the fundamental substances. Bz-1-chlor-bz-2-methoxy-benzanthrone. Of this 7 parts are added to a melt of 28 parts of potassium hydroxide and 28 parts of alcohol at 135° to 140° C. The mixture is stirred at 145° to 150° for about one hour, then dissolved in water, the solution boiled up, and the dyestuff precipitated by aeration. The product forms a pure blue vat, which dyes cotton of the same tone. On oxidation, the dyeing goes over to a bright greenish blue.

Efficiency in Utilizing Textiles Fostered by Federal Specialists

By Ruth O'Brien
In Charge, Division of Textiles and Clothing, Department of Agriculture

One of the important functions of the Bureau of Home Economics, Department of Agriculture, is to carry on research and disseminate information that will help in the better utilization of agricultural products in the homes of the country.

It is organized in three divisions, one of which, the Division of Textiles and Clothing, is concerned with assisting women in making a more economical and satisfactory selection and utilization of those fibers that are part of our agricultural program.

The staff is studying the various problems which such a service involves, and is issuing bulletins, leaflets, magazine and newspaper articles and radio releases showing how the cotton, wool and other textiles produced in this country can be used to the best advantage in clothing and household articles.

The Division also furnishes subject matter and illustrative material to the large corps of extension workers of the Department of Agriculture who hold classes in home-making among rural women. The scope of these activities can be shown best perhaps by describing some of the projects now under way.

The proper cleaning and care of textile materials is one of the most serious problems the home maker encounters. Its importance and the lack of information available on the subject have led to a series of investigations in the Bureau.

These include studies on the effect of the temperatures and reagents used in laundering upon the efficiency of the process and upon the fabric. In this connection it was necessary to develop methods of artificially soiling fabrics and of determining their degree of cleanliness after washing. A paper describing the results of this portion of the work is now in press.

A popular bulletin giving as much information as is possible in view of present knowledge has been issued, discussing methods and equipment for home laundering. It is hoped that the studies now being carried on will result in a more complete manual of recommended practices.

One of the most popular publications of the Bureau is the bulletin on stain removal from fabrics. Since this was written, more than a million and a half copies have been sent in response to requests.

Research on the effect of ironing temperatures and pressures on the durability of fabrics of different composition and construction is being done in co-operation with the Bureau of Agricultural Economics as part of a larger study on the value of the raw cotton grading system now in use.

Although ironing is one of the oldest of household activities, very little is known concerning the temperatures and pressures which should be applied to different fabrics. The color changes that take place and the effect on the gloss and tensile strength of the material are some of the things that are being studied. With the assistance of one of the largest manufacturers of household ironers in the country, an experimental ironer has been built upon which these tests are being made. It is expected that the results will be of benefit not only to housewives but also to all manufacturers of this type of household equipment.

Investigations have been made on the sizing properties of starches available from plants grown in this country but whose value for laundry and mill use has not yet been determined. Such uncommon starches as those from the dasheen, sweet potato and canna have been studied.

A technical bulletin has been published reporting the part of this work dealing with a method for measuring the stiffness of sized fabrics and the stiffness produced in fabrics by different starches and starch mixtures. The relation of penetrability of the starch to the stiffness is being given particular attention at this time.

Although the durability of many textiles is of extreme importance, practically no attempts have ever been made to learn the effects of different kinds of cotton and wool and of different fabric constructions on the durability of the resulting materials. A long-time test has therefore been started, in which sheets made of cotton selected and graded under the direction of the Bureau of Agricultural Economics will be tested for their durability. It is hoped to extend this work to include a large variety of fibers and fabrics.

As a part of this investigation, the types of wear and areas of wear shown by 400 sheets used in a Washington hotel have been studied. The results showed that most sheets wear out due to breaks in the filling yarns and that the area where the shoulders rub wears out first. These and other facts obtained from the study have been of interest to sheeting manufacturers.

On account of the recent depression in the cotton industry, the Division has given especial attention to better and more extended ways of using this fiber, which is of such great economic importance to the country. This has resulted in the development of designs for garments and household articles for which cotton is most suitable.

Clothing for children has been devised which is in accord with modern practices of child care. Self-help garments which children can manage themselves, sun suits, two-in-one summer dresses and self-help bibs are some of the items originated in the Bureau and introduced into practice. Leaflets describing all of these have been published. A study was made in co-operation with the Washington Child Research Center

on self-help play suits for nursery school children. Through the assistance of the Cotton Textile Institute, Inc., of New York City, fabrics were submitted for these garments by different manufacturers. These and various wool materials are being tested.

More extensive household uses have been developed for durable, inexpensive materials such as osnaburg, previously manufactured only for industrial purposes. As a result of new items showing curtains, coverlets and other articles made of this fabric, a greater market has been developed and women of moderate means have had placed at their disposal an inexpensive, attractive material.

A popular bulletin entitled "Selection of Cotton Fabrics," issued in the Farmers' Bulletin series, gives the principles in the construction of cotton fabrics and stresses the points to be noted in choosing such materials.

An investigation of particular value to those industries dealing with yardage and patterns was published a short time ago as a result of a survey of the amount of home sewing being done at the present time. The data obtained indicated that more cotton garments were being made than any other kind, and that the greatest difficulty the women had when making dresses was in fitting them. The Bureau therefore issued a bulletin entitled "Fitting Dresses and Blouses," which describes in an encyclopedic fashion the methods of remedying ill-fitting garments.

In order to obtain more fundamental facts concerning the consumption of different textile fibers, the Division of Economics of the Bureau distributed a questionnaire to men and women in all sections of the country, asking questions in regard to changes they had made in the use of various fibers and their reasons for these changes. This gave considerable insight into present textile requirements.

Thus, by studying from various viewpoints the difficulties being encountered by consumers in the retail market, the Bureau has been able to point the way to a more sane and economical utilization of America's textile products and in many cases to interpret consumer requirements to the producer very effectively.

Chemical Engineers Are Addressed by Clemson Professor

Dr. Chas. E. Mullin, Professor of Textile Chemistry, Rayon and Dyeing, of the Textile Department, Clemson College, S. C., addressed the annual meeting of the American Institute of Chemical Engineers in Asheville, N. C., December 3. Dr. Mullin will speak upon "Recent Developments in Artificial Fiber Production and Processing," basing his paper upon his recent wide investigations of these subjects in both Europe and America. Numerous samples of the artificial fibers and materials made from, or containing them, will be exhibited in connection with the paper.

Free Sulphur as a Tendering Agent in Connection with Sulphur Dyes

By George H. Johnson

Director of Research, Laundryowners' National Association

Some time ago we had the pleasure of discussing textiles and power laundries with a New York importer of fabrics. The subject of black-striped shirtings came up for consideration and it soon developed that in this instance Aniline Black dyed yarns were now being utilized in the stripes in place of a Sulphur Black that had formerly been used. Our good friend, when asked why the substitution of Aniline Black had been made, replied that "Laundry 'acids' for some reason or other tendered the sulphur-dyed yarns." Why these self-same cabalistic laundry "acids" did not also tender the Aniline Black yarns now being used in the shirtings is a mystery that Scotland Yard as yet has failed to solve.

Sulphur colors as a class are quite fast to ordinary laundering and to light, although individually the fastness varies somewhat with the dyestuff. Sulphur Blacks are generally considered as being the fastest to light with a few exceptions while Sulphur Oranges and Yellows are the most fugitive in this respect. One of the troubles that arises on occasion from the use of Sulphur Black is its tendency to attack and tender cotton fibers, the same complaint that was made by the New York importer. This tendering, however, is not due to the use of the laundry "acids" that generally are mentioned by certain textile groups with bated breath, but never quite defined. There is no reason, for example, why a laundering process should attack the black dyed cotton yarns in a striped shirting and leave the white ones unharmed unless the black yarns were tender previous to laundering. Detergents are not selective in action, but act uniformly upon fabrics. Millmen themselves have found that the true cause of the damage is the tendency of a portion of the free sulphur that is present in Sulphur Black to gradually oxidize to sulphuric acid and tender the dyed yarns. Especially is tendering likely to occur during long periods of storage at elevated temperature. One investigator, for instance, reports that when a sample of cotton cloth dyed with Sulphur Black showed tendering at ordinary room temperature after a year and a half had elapsed, the time was shortened to ten months at a temperature of 100° to 120° F. At 140° F. the cloth was weakened in four months' time and at 175° F. in one month. Investigators also report that the sulphur in Sulphur Black apparently is present in three distinct forms as follows:

1. Mechanically free sulphur.
2. Stable sulphur that is oxidized only by strong oxidizing agents.
3. Unstable sulphur that is chemically active and easily oxidized to sulphuric acid in the presence of air and warm temperature.

It is this chemically active sulphur that is largely re-

sponsible for the tendering of some Sulphur Black dyed cotton yarns used in ginghams, chambrays, and warp striped woven materials. Black cotton hose sometimes is tendered for the same reason.

When a housewife or retailer encounters a Sulphur Black damage in a black and white gingham house dress for the first time and notices that during the first washing many of the black yarns have been washed away, leaving the white ones intact, it is no wonder that on first thought one should believe that the fault is one of careless laundering. And yet, considering the problem merely from the point of logic, were laundering at fault, the white yarns also should have been weakened by the same supplies as supposedly tendered the black ones. No laundry process can be held accountable for a Sulphur Black damage in spite of the fact that the defect usually is not discovered until after the first laundering.

Newport Adds New Black to Anthrene Dye Series

The Newport Chemical Works, Inc., made another addition to its list of Anthrene dyes at the end of last week with "Anthrene Black 2G Double Paste." Although carrying the index number 1102 of another similar color in this series, officials of the company stated that it is not a duplication. Anthrene Black 2G just announced possesses a brilliant hue of slightly greenish cast required in certain fabric dyeing, it was stated.

General Dyestuff Colors

The General Dyestuff Corporation have just issued a very instructive booklet describing the properties and uses of Leonil S and Nekal BX.

In a new card, "Fast to Light Shades on Wool Yarn Dyed from an Acid Bath," also published by this concern, a range of 168 shades on woolen yarn is shown, produced with level dyeing acid dyestuffs.

A circular describing the properties of Katigen Yellow Brown GR Extra, a sulphur color manufactured by the General Aniline Works, which corresponds in fastness and dyeing properties with the imported type of the same name has also been issued by the General Dyestuff Corp.

Du Pont Colors

The Dyestuffs Department of E. I. du Pont de Nemours & Co. have placed on the marked their new color, Du Pont Scarlet Y for Lakes, which is yellower in shade than their previous brand, Du Pont Scarlet 2R for Lakes, but similar in properties and strength.

They have also placed on the market a line of azoic colors for printing under the name of Du Pont Naphthanil Diazo Colors for Printing.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i. e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

INDANTHRENE SPECIALIST AND DYER

Experienced in Indanthrenes, naphthols, sulphurs, directs on rayon, silk and cotton. All types of machines. Address: Classified Box No. 563, American Dyestuff Reporter.

POSITION WANTED

Dyestuff salesman, with many years of sales and laboratory experience, is desirous of a suitable position. First-class references. Address: Classified Box No. 566, American Dyestuff Reporter.

PURCHASING AGENT

Highly recommended, widely experienced and competent buyer is desirous of securing position as purchasing agent of dyes and chemicals. Twelve years in present position. Address: Classified Box 567, American Dyestuff Reporter.

POSITION WANTED

Thirteen years' experience; excellent mill contact; unquestionable references; age 35; married. Would prefer Pennsylvania and New Jersey territory but will travel. Available immediately. Address: Classified Box No. 568, American Dyestuff Reporter.

SALESMAN WANTED

Manufacturer of dyestuffs, oils and chemical specialties has an opening for a good man who has a thorough knowledge of the Philadelphia territory. Salary and commission. State full particulars. Address: Classified Box No. 569, American Dyestuff Reporter.

RAYON DYER

Dyer—rayon skeins; seven years' thorough experience all types of dyes; good matches; fine winding; excellent finish; good references. Address: Classified Box No. 570, American Dyestuff Reporter.

COLOR SALESMAN

Salesman, at present employed, Pennsylvania territory, selling colors and allied products, desires change with reliable concern, any territory: Address: Classified Box 571, American Dyestuff Reporter.

YOUNG SILK DYER WANTED

At once by silk dyehouse in the Middle West, a young silk dyer who has had lots of experience in silk skein dyeing. State experience and salary expected. Reply to Classified Box No. 572, American Dyestuff Reporter.